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AN INQUIRY INTO THE MEDICAL CURRICULUM

BY THE

EDINBURGH PATHOLOGICAL CLUB

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PAPERS CONTRIBUTED TO THE INQUIRY

AND

REPORT BY THE PATHOLOGICAL CLUB

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PREFACE

THE Edinburgh Pathological Club carried out during Session 1917-18 an inquiry into the medical curriculum. An attempt has been made to define the extent of teaching and training required by the undergraduate in each subject of the curriculum. Papers were contributed by members of the Edinburgh School; but in order to secure a wider expression of opinion, contributions were obtained from eminent teachers in the other Scottish Universities, and also from members of the medical schools in Oxford, London, Dublin, Manchester, Newcastle, and Birmingham. The inquiry included also a series of papers dealing with special subjects by members of the Royal Army Medical Corps, general practitioners of medicine in England and Scotland, and by members of the scholastic profession.

At the conclusion of the inquiry the Club appointed a Special Committee to review the whole discussion and formulate the conclusions to which it had led. The report by the Committee was adopted by the Club at its meeting on 27th November 1918.

The papers, with a *résumé* of the discussion and the final report adopted by the Club, have been published in the *Edinburgh Medical Journal* 1918-19, and are here collected for issue as a separate volume.

The publication of the papers in the *Edinburgh Medical Journal* has been of invaluable assistance to the inquiry. It could not have been carried through without the hearty co-operation of the editors—Mr. Alexander Miles and Dr. J. S. Fowler—to whom the Club expresses its most cordial thanks.

To all who have contributed to the inquiry, and especially to those who have come from a distance to take part in the discussions, the Club acknowledges its indebtedness.

The expenses of issuing the report in reprint have been defrayed by a grant from the Carnegie Trust for the Universities of Scotland, for which the Club begs to express hearty thanks.

J. LORRAIN SMITH,
Convener of Special Committee.

HARRY M. TRAQUAIR,
Secretary.

The Training of the Student of Medicine:

AN INQUIRY CONDUCTED UNDER THE AUSPICES OF THE
EDINBURGH PATHOLOGICAL CLUB.

THE TRAINING OF THE STUDENT OF MEDICINE:

An Inquiry Conducted under the Auspices of the Edinburgh Pathological Club.

I.—THE AIM OF MEDICAL EDUCATION.*

By Sir JAMES MACKENZIE, M.D., F.R.S., F.R.C.P., LL.D.

It was a pleasure and honour to me to receive your invitation to address you on medical education. This subject has been an object of interest and study to me for many years, and I have formed certain very definite opinions as to the manner in which it should be conducted. Moreover, the time the Pathological Club has chosen for its investigations is extremely appropriate, for the next few years will see great changes in the relation of medicine to the body politic, while the present time, with its grave effects upon every phase of life, reacts strongly upon medicine, and shows to the inquiring eye many defects which might have been avoided had the teaching of medicine been different.

It is well for a man engaged in any work to have a clear perception of his aim, and from time to time to pause and consider whether he is pursuing his aim by the best means. It is particularly necessary for the teacher of medicine to do so. The great tendency of the human mind is to fall into a groove and pursue its work on lines that give no occasion for mental strain. Mental effort is often exhausting, and as years pass it becomes ever more and more irksome, so that with an everchanging subject, such as medicine, it is well that the methods of teaching should be repeatedly overhauled.

An uneasy sense is beginning to prevail that all is not as it should be in the medical world, and of late years several attempts have been made to place the teaching on a better footing. We have, for instance, the reports of Abram Flexner on the teaching of medicine in America and in Europe. These reports are full of the most interesting and illuminating facts, and they should be carefully studied if we wish to grasp the ideals and methods that prevail in the different countries. We have had, again, the evidence given before the Royal Commission on University Education in London. Here we have the views, in detail, of some of the leading teachers of the world. It might be said that with such recent and abundant testimonies there is no need for any further inquiry, and that your labour and mine will be a work of supererogation.

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* Being the Inaugural Address of the 181st Session of the Royal Medical Society, delivered on 9th November 1917 to the Society and the Edinburgh Pathological Club.

Long before these inquiries had been made I was studying the subject, and I eagerly read these publications, and found that I had approached the subject from a point of view that neither Flexner nor any of the witnesses before the Commission had taken. These give the views of the doctrinaire and the teacher; my experience was that of the taught—one on whom the experiment had been made.

In all the inquiries of the past there has been this curious limitation of outlook. The effects of teaching upon the general practitioner, so far as it qualifies him for his work, has received little or no consideration. Doctrinaires, like Flexner, have said such a system is bad, and such a system is good, but this is done entirely from a purely theoretic standpoint. Similarly, running through the whole of the evidence of the distinguished teachers the matter is always presented from the teachers' point of view—the effect of their teaching is not inquired into, and it is tacitly assumed that the teaching has been good enough for the general practitioner. It never seems to have occurred to those who selected the witnesses, nor to the distinguished members of the Commission, that an instructive light might be thrown on the subject by getting the evidence of those who had received the education, and who had tested its practical efficiency. This inability to realise that there was an essential source of information untapped brings out one of the greatest defects in our methods of dealing with medicine. It shows such a profound misconception by those in authority of what clinical medicine really is, that any policy that is based on this restricted evidence is bound, in the long run, not only to retard the progress of medicine, but to set it on such wrong lines that more harm will result than if the matter were left as it is. This is my view of the recommendation of the London Commission and of Flexner, and it is because I strongly hold this view that I am here to-night, and welcome the fact that you also are not satisfied with these reports, but are determined to submit the matter to an independent investigation.

These reports, however, are valuable if for no other reason than that they are warnings of the methods to avoid. To begin, no one seems to have recognised the peculiar nature of the subject with which they were dealing. Medicine has only recently come to be considered as a science; its peculiar nature has not been recognised, and every academic scientist or educationalist believes he is able to indicate the lines on which it should be pursued. It has so many branches, some of them pursued by strictly limited methods, that the methods of one branch are often supposed to be applicable to all others. Thus we have the various branches insisting on their special importance, and so insistent is their attitude that we find a limited section dominating the whole science. Thus the laboratory and hospital worker have practically acquired the power to guide and regulate the teaching and investigation of the whole sphere of medicine, totally unaware that great fields of medicine essential to progress lie outside their spheres. When those with a limited outlook become the guides in any enterprise, error and inefficiency are bound to hamper their efforts. It behoves us to avoid this, and to do so we must have clearly before us what is the goal we desire to reach ; and when this is clearly understood, little difficulty will be experienced in realising how best to achieve our object. It is the absence of the conception of a definite object, with the consequent inability to perceive the nature of the defects in teaching, that renders the evidence before the London Commission so ineffective.

In dealing with this matter I approach the subject from a point of view that has not been considered, viz. that of a general practitioner who has sought for the varied phases of disease and has had the defects of medical education forced upon him. In an attempt to supply these defects I was forced to undertake research upon lines that had been very imperfectly understood, and in prosecuting this research I became aware not only of the defects, but of the attitude of the teaching profession towards medical problems. I have found it most difficult, indeed impossible in many cases, to convince our authorities of these defects, and, in consequence, they have not been able to grasp the reasons for a reform in teaching. As I realise that, before an attempt at reform can take place, it is absolutely necessary that you should realise what are the deficiencies in our knowledge of medicine, I shall to-night limit myself mainly to calling attention to certain fields of knowledge which are necessary to advancement of medical science, and try to show how restricted is our knowledge of this. This point of view is, I recognise, mainly personal, but I would like you, in your investigations, to spend some time in seeing if the condition of medical knowledge is as I describe it. If you can see its condition from the aspect I present, then the path of reform will be made fairly easy.

The Aim of Medical Education.—The aim of the medical profession is to prevent and cure disease, and to relieve suffering. But before we can do either of these things it is necessary to recognise the disease, the manner of its onset, and the course it pursues. The aim of medical education is to enable the practitioner of medicine to detect disease, to recognise its dangers, and to instruct him how to prevent and combat them. This has been the aim in the past, but the methods pursued have shown that the aim was not clearly grasped, as we find that only a limited knowledge has been acquired of the great majority of diseases.

To appreciate how this aim may be attained, let us pass, in brief review, the life-history of disease. Its onset in the body is invariably insidious with little disturbance of the economy and no visible sign of its presence. By and by the patient becomes conscious that all is not well with him ; there is a loss of that feeling of well-being which accompanies the healthy state. Disagreeable sensations arise, at first vague, but later they become more definite, and these may become so urgent that he seeks advice. Still no evident sign of disease may be perceived in the most careful examination. By and by the disease, being situated in some organ or tissue, changes the constitution of the part, so that its presence is now recognised by a physical sign. The course hereafter varies—it may end in death or impaired health, or, being of a temporary nature, in recovery. The course of the disease may be a matter of days or many years, but the general characteristics are the same.

We, as doctors, detect disease by the presence of symptoms. Hitherto in medicine the chief progress has been made of the minute study of disease after the patient has died, or after it has produced a physical sign—that is to say, after the tissues have been damaged. So that one might say that the last fifty years of medicine has been the era of physical signs.

Early Stages of Disease.—It is universally accepted that the earlier a disease is detected the more amenable it is to treatment. It behoves us then to recognise disease in its earliest stages. If you will give careful consideration to the matter you will realise the importance of recognising the early stages of disease, and, moreover, you will discover that, from the patient's point of view, it is vastly more important to observe the early stages of disease than to recognise its peculiarities when it has produced physical signs, or when it is found on the post-mortem table.

Attitude of Teaching to the Early Stages.—What are we doing to discover these early stages? The teaching section of the profession may admit the truth of the proposition that the earlier a disease is discovered the more hopeful it is for treatment, but they have never realised how little they do to provide the necessary knowledge. To appreciate this, look at the attitude of the teaching profession towards the study of disease, bearing in mind always that the patient's interest is our chief aim.

Hitherto research has been restricted chiefly to laboratories, and in a less degree to hospital wards. Consider the stages of disease you find there studied. It is unnecessary to dwell upon the careful study in the post-mortem room, as that is a stage which does not interest the patient. In hospital wards we find the patients with disease so far advanced as to present a physical sign, and you all know what time and care is spent on teaching the physical signs. You know also that little interest is excited in the student unless there is something he can either see, hear, or feel, with the result that the well-trained student leaves the hospital convinced that he has grasped the essence of medicine because of his ability to detect a physical sign and to know the mechanical basis of its production. Moreover, in the more advanced schools, where there are clinical laboratories, it is always to the wards that they are attached. This gives the opportunity of confirming the knowledge of the cause of the physical signs, and stamps the impression on the student of the essential importance of physical signs. We see, therefore, that disease, when it has reached an advanced stage, and after it has killed the patient, has been very thoroughly studied.

But what of the stages that preceded? What of the time, it may be many years, of the gradual progress of disease before the production of a physical sign—the time when the disease was amenable, it may be, to treatment, or more amenable to mitigation than in the later stages?

The patient in the early stages shows no objective sign, but he has a definite sensation which tells him that all is not well. We all know that such patients go to the out-patient department. Here we have the younger members of the hospital staff—men who have been trained in the hospital wards, where the training has made them adepts in the detection of physical signs. What is their attitude? I have visited many hospitals in this country and abroad, and the procedure is wonderfully alike; wherever I have gone, a patient with no physical sign is put off with a bottle of medicine and told to come again. He may do so for a month or a year, until a physical sign is detected, and then he may be sent to the hospital ward.

Now I know that this description will be contested by many as an untrue or exaggerated description of the way things are managed in some particular schools or hospitals, and I admit that exceptions exist here and there, yet it is sufficiently accurate to be of use in focussing your attention on the defects of medical teaching. I have presented this view to many of my teaching friends and they have resented it, and told me that they had gone through many years of out-patient practice and had observed all that there was to be detected in the cases without physical signs.

The Lack of Knowledge of the Phenomena Produced by the Early Stages of Disease.—My reply is, that they had gone through their work in a state of partial blindness. It will no doubt be granted that subjective sensations are the earlier signs of disease, but the profession has never been trained how to examine a patient when the disease only presented subjective sensations, so that the out-patient physician has not known how to set about the examination. The reason that I make this statement, without fear of contradiction, is, that the sensations of a patient have never been studied with that care and precision which would enable any teacher of the present day fully to appreciate them. There is not a single sensation which man is capable of experiencing that has been thoroughly investigated. Until that is done we shall be incapable of detecting the early stage of disease, and it is because this has not been done that I state that the out-patient department has not yet been fully utilised. Take the most universal of all sensations, that of pain, a sensation which, if understood, would reveal the early stage of disease in large numbers of cases. Yet we are ignorant of the most elementary facts necessary to its understanding. We do not even know the tissues capable of producing pain, and we have but the slightest knowledge of the nature or kind of stimulation that can induce pain. We are to a great extent ignorant of the mechanism by which it is produced, and of the laws governing its radiation we have no knowledge. We know, for instance, how informative the spread of pain is in heart disease or renal colic, because the distribution of the pain is so remarkable; but the distribution is equally informative in many other diseases of which we know little or nothing. It may be said we know as much as is necessary for practical purposes, but thus speaks the man who wilfully shuts his eyes to the light, and the truth is not in him. As one who has laboured much at the subject, I assert that, once we have discovered all the facts concerning pain, a stride forward in our knowledge of clinical medicine will have been made which will lead to some of the greatest discoveries in medicine. What is true of the neglect of the study of pain is true of every other sensation, such as exhaustion, giddiness, faintness, palpitation, nausea, heartburn, breathlessness.

Does it not strike you as most anomalous that there should have been spent a vast amount of labour in minutely scrutinising the tissues of a man after he has died, or in patiently studying a microbe that has been detected in his body, noting what happens to it in test-tubes and in nutrient fluids, and in guinea-pigs, and yet the signs which show the disease in its entrance into a man's body, which would have warned us of its presence and given us a clue to his treatment, have received relatively little consideration.

The Reason the Early Stages are Unknown.—You will understand, then, that an imperfect conception of what is the aim of medical science misleads the teachers, and not only reacts upon the students, but hampers progress. It is evident that the study of the early stage of disease is of the very first importance, that it is fraught with difficulties, and that the recognition of the nature of the disease is infinitely more difficult at this stage than when a physical sign is present. Yet observe how topsy-turvy is the conception of teaching—the easily discovered stage of disease, and the most hopeless for treatment, is by custom handed over to the experienced physician, while that which is most difficult to diagnose and the most hopeful for treatment is placed in the hands of the least experienced. This, then, is one matter we must clear up before we attempt to alter the methods of teaching.

The Progress of Disease.—There is another aspect of medicine which the teachers in the past have failed to appreciate at its true value, and that is the course a disease runs, particularly those diseases of long standing. It must be apparent to every man who gives thought to the matter that before we can intelligently treat a disease we must know how it will affect the individual suffering from it. Not only is this of importance in order to estimate the future life of the individual, but also to give us the knowledge whether the disease is amenable to treatment. This field of medicine is that which is included under the term "prognosis," and it may surprise many of you when I state that this field, so essential to medical knowledge, has seldom been properly inquired into. We constantly get addresses on the importance of the subject, and in all our text-books there is devoted to every disease a chapter or at least a paragraph on "prognosis." The admiring reader cannot but be impressed by the apparent fulness of knowledge and imagine that the subject has been thoroughly studied. Unfortunately this is not the case, for when we go carefully into any single protracted disease we discover that of accurate knowledge there is indeed very little. To bring the matter home to you we may apply such a test as the following:—Let a general practitioner discover in his patient an abnormal sign, such as a murmur or an irregularity of the heart. He wishes to know what significance it may have in the patient's future. He turns to any number of text-books, written specially for his edification, and does not find the desired knowledge. This lack of knowledge has been more than ever forced upon me during the last few years, on account of the attitude of many of the profession to recruits and soldiers who have murmurs. The inability to estimate the value of murmurs is, in my experience, almost universal. It is a matter I have laboured at for many years, and I have acquired a limited amount of knowledge, so that I can estimate the value of some murmurs. I am daily seeing people whose lives have been rendered miserable, whose careers have been interfered with, who have been subjected to prolonged and expensive treatment, all because of the inability to estimate the significance of a murmur. While writing this address I was consulted by a young lady who had been told she had an incurable affection of the heart, was forbidden to play games, and prevented being sent to a college, and warned she would never be able to marry, because of the presence of a murmur. There is no use blaming the doctor; the fault lies in the teaching.

Limited Opportunity for Teachers to Study the Progress of Disease.—The source of the fault lies in the fact that it has not yet dawned upon the profession in what manner this important subject should be studied. The experience of teachers is mainly restricted to the laboratory and hospital. Now, to get an insight into the course of disease it must be watched from its onset, during all the vicissitudes of life, till the end.

In neither laboratory nor hospital can this be attained, for reasons I need not dwell upon. Our teachers there have not the opportunity of following individual cases to get the requisite knowledge, and I do not blame them for not acquiring a knowledge of which their circumstances have denied them an opportunity. It is necessary that they should frankly recognise their limited opportunity and the great deficiency in their knowledge. I have just been reading a most valuable work upon arteriosclerosis by a great teacher and physician. All his cases quoted and all his experience are limited to the later stage of the disease, and one searches in vain for a hint as to the onset and progress of this condition. It is like reading the last volume of a three-volume novel, the first two volumes being lost. One wonders how the last stage was reached. Again I do not blame the writer for this deficiency, because circumstances denied him the opportunity to see the early stage. But he should have realised his lack of opportunity, and recognised that the disease he dealt with could only be seen in its entirety by one who has had the opportunity of watching it through all its stages, and that individual was the general practitioner. Being a teacher he should have recognised the limited nature of his own experience, and instructed the student that he was the person who would have the opportunity. In addition, he should have taught him what methods he should employ to fill up the great gap in our knowledge. What is true of this particular disease is true of all others.

How the Lack of Knowledge of the Early Stage and Course of Disease Hampers Progress.—This great defect in our knowledge of the course of diseases reacts upon medicine in many directions. There is a belief amongst teachers that they possess this knowledge, while all the time their knowledge is slight and vague. The result of this defect is that other departments of medicine are rendered sterile and ineffective. There are many problems crying out for solution, and all attempts to solve these fail because of this deficiency in knowledge. Indeed, when attempts are made to solve them, there is often no one with the necessary knowledge even to know how to proceed. Take one or two instances. There is not a general practitioner but will be faced time and again with the question whether a woman with some affection of the heart is able to undergo the strain of pregnancy with safety. If you will consider the importance of this question to the woman, her husband, and her family, and to the doctor on whose decision life or death depends, you must realise the importance of the problem. Yet those to whom we look for guidance have utterly failed to solve this problem, and they do not even know how to set about to solve it. Take another illustration which should appeal to the men of the Edinburgh School of Medicine. There is no tradition of which our school should be prouder than its bringing into practical use chloroform anæsthesia. For many years chloroform was used freely and fearlessly without the slightest danger, because it was administered in an intelligent manner on strictly scientific principles. In other places where these methods were not understood deaths occurred. Inquiry after inquiry into the reason for these disasters have taken place, all failing to bring the cause of failure to light. Why have these inquiries failed? Simply because the investigators were not qualified to undertake the work. They did not possess the requisite knowledge and therefore did not take the proper steps.

Let me illustrate how this phase of the deficiency in medical knowledge was forced upon me. Shortly after entering general practice I had the misfortune to attend a pregnant woman who died undelivered on account of heart failure. After this melancholy experience I felt that this death might not have occurred if I had had a better knowledge. My teaching had not given me the necessary knowledge. On studying the literature of the subject I found that sufficient knowledge did not exist. The best work on the subject was by Dr. Angus Macdonald of this city, and if you will read the latest obstetric text-books you will find that practically no advance has been made since Macdonald published his book in 1878.

Finding the literature wholly unsatisfactory, I resolved that I should undertake the investigation. It struck me no one had a better opportunity than the general practitioner. So I studied the circulatory condition of women before pregnancy, watched them carefully during the whole time they were pregnant, observed them closely during labour and the puerperium, and for months and years after. I studied not only cases with damaged hearts but also many healthy women. After several years I had collected a large mass of material. I found, among other things, changes in the size and position of the heart, murmurs of different kinds, variations in rate and rhythm, and other departures from what is usually considered the normal.

When I came to analyse my observations I found a great variety of signs which needed interpretation before I could find out what bearing they had on the matter. The essential problem had resolved itself into the question of heart failure. Pregnancy in some induced heart failure, so that I wanted to know, did any of these signs indicate heart failure, or did they foreshadow its occurrence? I could not answer these questions. I turned to my text-books for help, I ransacked libraries without avail, till at last it dawned upon me that the knowledge I wanted did not exist. Take, for instance, two groups of phenomena—murmurs and irregular action of the heart. Having detected a murmur or irregularity in a heart, I wanted to assess their value from the point of view of the patient's future, and its relation to heart failure. You must see that no progress could be made to solve the problem till this was done, but I could find no answer to this question.

Having had the lack of knowledge forced upon me in this way, I wondered if I could not do something to shed a light upon this matter. When I started in a somewhat hesitating fashion on this quest I had no idea where it would lead me. Not only did it bring to light many new facts, but it brought to me a consciousness of the deficiency in our knowledge in fields essential to the progress of medicine, and a knowledge of methods by which these deficiencies could be made good, and it is on the strength of that knowledge I have the courage to appear before you to-night.

When I found that I could not get any further in the inquiry as to the danger of pregnancy in heart disease until I was able to assess the value of the phenomena I detected, I took up each of them and subjected them to special study.

Thus, with irregular hearts, I first sought to find out the nature of the irregularities, and found that they were of different kinds. I will not weary you with the steps I took to differentiate one form of irregularity from another; suffice it to say that I became able to recognise and classify the different forms. In later years other investigators took up this subject, and in various ways the physiological basis of the great majority of the different forms of irregularity has been clearly established.

But though this differentiation was a necessary step, it only led me a little way in solving the questions I wanted to solve. What bearing had the cause of the irregularity on the heart's efficiency? Was the irregularity an evidence of heart failure, or did it indicate a condition that under the strain of pregnancy might lead to heart failure? To solve these questions there was nothing for it but to watch individuals who presented the irregularity. My opportunities for this purpose were excellent. By diligent search I found all sorts of irregularities among my ordinary patients. As a family doctor I could keep in contact with them, and watch the young grow up into manhood and womanhood, and the middle-aged pass into old age, and note them during periods of physical stress and while suffering from acute disease. I noted as I went along such incidental signs as might have a bearing upon the individual's health; so that after long years I obtained a knowledge which enabled me to indicate the significance of some of these phenomena, and to assess their value. I do not pretend to have settled these questions, but I have made a slight contribution to the subject, which may help others who may seek to follow this line of investigation.

The Differentiation of Symptoms.—This method of carefully watching the progress of disease brought to light many phenomena which had been overlooked or ignored. By the study of these phenomena a clear conception of the interdependence of symptoms and their significance was obtained. I was struck, for instance, with the fact that the symptoms of disease had never been clearly differentiated on the basis of the manner in which they were produced, but such signs as were recognised were jumbled together in a state of confusion. One of the great hindrances to progress in medicine is this want of clear differentiation in any subject. When I took up this matter of irregular heart action, over thirty years ago, no attempt had been made to distinguish the different forms of irregular heart action on any intelligent basis. We can easily see that before we can assess the value of any sign or symptom it is necessary to separate it clearly and distinctly from others that may resemble it. This may seem such a self-evident proposition as barely to need referring to. Yet quite recently numbers of teachers of medicine have declared in the press that the teachers of thirty and forty years ago knew as much about irregular hearts as we do at the present day. Now this inability to appreciate the first stage in all scientific investigations clouds the whole field of medicine. The symptoms produced by disease permit of a differentiation, based on the mechanism of production, which assists greatly in revealing the features of disease. We have, for instance, a series of phenomena which are recognised by structural alteration of the organ, those phenomena which are included under the designation of physical signs. We have another series of phenomena which are produced by the impaired functions of the organ, in many instances revealed by effects on other organs remote from the seat of disease. We have another series of phenomena arising from reflex stimulation of the central nervous system—a series often of the greatest assistance in locating the site of the lesion, but which hitherto have received barely any consideration.

Time will not permit me to illustrate how obviously important this aspect of medical knowledge is to the physician and surgeon, and I can but briefly refer to other departments to show how they should be influenced.

The Imperfect Knowledge of Symptoms Reacts upon all Branches of Medicine.—Consider how progress has been delayed in the department of bacteriology on account of this lack of knowledge of the nature of the symptoms of disease. It must be evident to everyone that if bacteriology is ever to have its full influence on medicine, other methods of investigation must be pursued besides those which are undertaken in laboratories. The vast majority of the population cannot have the benefit of laboratory investigation, nor is it necessary that they should have, for this reason, that on the entrance of a microbe into the human body certain phenomena are produced, and these phenomena are peculiar to the individual microbe. We infer, for instance, that measles, scarlet fever, and smallpox are all due to microbic invasion, and although the microbes have not been discovered, the evidences of their invasion are well known. The invasion of the body by other microbes will give just as clear evidence, only as yet we do not know how to search for the evidence. We recognise that a slight rise of temperature usually indicates invasion, and the heart, when played upon by a toxin, may vary in its action, while other parts of the body may reveal the peculiar effect of different microbes. Recent investigations by Dr. Marris have shown, for instance, that in typhoid fever the heart is influenced in a peculiar manner, inasmuch as the typhoid bacillus manufactures toxins whose influence upon the heart resembles that of the digitalis group of drugs. The realisation of this fact opens up a wide field, and from my own experience I know that there is a different reaction produced by the various organisms, and it is imperative that the bacteriologist should come out of his laboratory and study the effects upon the human body of the various microbes.

This aspect of medicine will also, once it is properly grasped, modify the conception of physiology. At present physiology is looked upon as being the most scientific portion of the medical education. The methods employed are supposed to give information so exact that the youthful mind becomes trained to scientific observation. I think it is scarcely realised how crude and limited are all physiological experiments. Methods of exploration which proceed by opening up the body disturb the economy and modify the reaction that must come afterwards; while the stimulus that the physiologist applies is of such an abnormal kind as Nature never experiences. No doubt the stimulus is sufficient to give a reaction, and this reaction has thrown much light upon the workings of the body, yet the recording of these reactions is, after all, very crude, although the impression prevails that physiological methods are so refined and delicate that the effects of stimulation are carefully recorded. As a matter of fact, it is only the grosser reactions that are detected. In most physiological experiments many effects are produced which are entirely unperceived. If we compare the subtle stimulation that produces reaction in the human body with the results of physiological observation we shall see what I am trying to illustrate. Take, for instance, the reactions of some simple disease, such as a gastric ulcer or an appendicitis. Here we get the effects of a stimulation of the central nervous system; the stimuli are far more delicate, and more in accordance with natural processes, than a physiological experiment. We get pain of a very definite kind, altered sensibility of the skin and other structures of the external body wall, contractions of portions of the abdominal muscle of a peculiar kind, which is scarcely yet recognised, and reflex effects upon remote organs stimulating them to activity. The regions in which these phenomena occur, and the manner in which they spread, point to the fact that there are paths in the spinal cord of which neither the physiologist nor the neurologist have any conception. All these phenomena are lost to the physiologist. You get these signs for instance appearing after a strong peristalsis of some hollow viscus, as gall-stone colic, renal colic, intestinal colic, and all the physiologist has to show is the muscle contraction. These phenomena, though lost to the physiologist, are of the greatest importance to the clinician, because it is by their presence that the varying phases of disease make themselves manifest, and it is only by seeking for such evidence that the knowledge essential for us to understand disease will be obtained. Investigation which reveals these phenomena is absolutely essential for the study of physiology. I do not decry academic physiology, but I do insist that there is also an imperative call for a form of physiology which will recognise the symptoms produced in the human subject, and that the aim of such physiology will be to explain the mechanism by which these phenomena are produced, and such physiology must be guided by the demands of medicine.

If we turn to the field of therapeutics we shall find that advance has been delayed on account of the absence of knowledge of the kind to which I am referring. If I were to make the statement that there has not been a single drug in the whole pharmacopœia, whose effects upon the human body have been properly studied, you would accuse me of exaggeration. Nevertheless it is perfectly true, and the reason is simply this, that the knowledge does not exist to enable any individual to appreciate the action of any drug upon the human body. In fact, the principles underlying the reaction of drugs have not yet been realised.

This lack of knowledge was forced upon me in my investigations into the action of cardiac drugs. When a general practitioner, I kept for ten years careful notes of all the patients to whom I gave digitalis. When I came to analyse these results I found that digitalis acted in a seemingly capricious manner, profoundly affecting some hearts, and having no effect upon others. When I grouped them together I found that those hearts which were affected by digitalis belonged to very distinct groups. The chief group that was thus affected was recognised by a peculiar irregular action of the heart. I found, further, that digitalis produced irregularities, and that the appearance of these irregularities was of great significance, not only in revealing the effect of digitalis, but in revealing forms of disease in the heart that were unsuspected. Two things were revealed by this investigation—First, that it was impossible to study the effect of any cardiac drug on the heart until the investigator was acquainted with the various forms of irregularity the heart was capable of showing. The second thing revealed from this investigation was, that the action of digitalis was modified by the nature of the disease by which the heart was affected. I want you to grasp the significance of this second principle, because it has never been realised, and its lack of recognition has hampered the progress of therapeutics, and diverted investigation into wrong channels, for this principle is applicable not only to the heart, but to every organ in the body. You can see, for instance, the confusion in the use of the simplest remedies—say aperients. They are rarely given with any consideration of the state of the patient's intestinal tract. It is manifest that such remedies are bound to vary in people with a dilated stomach, pyloric stenosis, dilated colon, adhesions, and so forth.

In another direction this neglect has misled progress. You know advance in pharmacology is supposed to be accelerated by laboratory research into the action of remedies, and the experienced pharmacologist is supposed to be the authority on the action of remedies. In view of the fact that the reaction to remedies is modified by disease, how is it possible he can ever arrive at a knowledge of the action of a remedy on a human being when his opportunities are limited to the organs of a healthy animal?

The peculiar nature of the science of medicine prevents anyone realising how its advance can be made unless he has himself prosecuted definite inquiries and discovered the nature of the lack of knowledge. At this day there are many problems calling for solution, and on account of lack of knowledge we do not even know how to proceed to their solution. Not only that, but I would further state that the profession has such a confused notion of medical research that it does not realise that there are problems to be solved. I do not mean this in any way to be a reflection on the individual members of the profession past or present, but merely point it out in order that we might grasp more clearly the road which leads to our goal. Supposing one hundred years ago the College of Surgeons had constituted itself into a body to inquire into the cause of suppuration in wounds; that is, supposing the surgeons were so enlightened as to recognise that there was need for such an inquiry, for the first step in solving a problem is to be conscious that there is a problem to solve. We know that had such an inquiry been undertaken, numerous reports and memoranda would have been made, but they would have failed to bring to light the cause of suppuration, for the simple reason that they did not possess the knowledge of bacteriology which was necessary to its attainment.

The Fundamental Fault in Medical Knowledge is Due to Academic Authority.—Turning now from the problems which, if progress is to be achieved, must be solved, let us consider the reasons why these problems still remain. To do this we must study those who are in authority to see if they possess the qualifications necessary for the teaching of medicine. To begin with, we must remember we are dealing with human beings—human beings as teachers and human beings as the taught. It is human to err. If in any sphere of life a few individuals are set apart from their fellows, and given power over their fellows, it is but human that such a select body will seek to aggrandise their position at the expense of their fellows. It is unnecessary to enlarge upon this general statement, as the world's history shows its truth in all spheres of human thought and action. In some spheres it may be good or it may be bad, but in intellectual matters, and especially in science, it can only be bad. In medicine the teachers have practically taken into their own hands the guidance of education and all the intellectual interests of the profession. In the direction of affairs which should influence the teaching of medicine and the prosecution of research the great bulk of the profession are excluded. If you will but glance at the evidence before the London Commission, it seems never to have entered the heads of the Commission, or of the witnesses, that there was a general practitioner's point of view. It is recognised by every general practitioner, who gives the matter consideration, that his education was woefully inefficient. The majority of patients which the general practitioner is called upon to treat present phenomena which he was never taught to recognise, while the diseases themselves are, many of them, quite different from those seen in hospital. The result is, that general practitioners, after they enter practice, have to forget much of what they have been taught, and set about re-educating themselves. Notwithstanding this, teachers whose knowledge of medicine is restricted, more or less, to their special subjects, consider themselves qualified to tell the student who is to become a general practitioner what is best for him. There is no one in the whole faculty of medicine who, by training, has a sufficiently wide outlook to see the whole series of subjects in their proper perspective. The result is, that each one tends to exalt the importance of his own special subject to the detriment of education as a whole. I will not at present labour this point, but, lest it should be denied, I will give a few illustrations. I referred to the question of pregnancy and heart disease—how has it come about that a problem of such importance has not been solved? Simply because under the present methods there is no body of men with the necessary all-round knowledge capable of solving it. The obstetric teachers know too little of the heart and its manifestations, and the physician has no opportunity to study pregnancy. Or take the problem of the danger of chloroform administration. There is not a class of men in the whole faculty capable of solving it; nay, more, experience has shown that there is not the knowledge necessary to understand the means by which such a problem could be solved. The fact that there are whole fields of medicine absolutely essential to the progress, from which the teaching class are shut off, has never yet dawned upon the academic mind.

The trend of thought at present, as shown by the methods employed in the so-called advanced medical schools, and as shown by the evidence of the witnesses before the London Commission, is distinctly towards a system which will but aggravate the present problem. The cry of each witness is for more laboratories and better opportunities, not recognising how they have failed to utilise the opportunities they already possess. They fancy that their failures are due to an absence of methods, while in reality it is due to a lack of perception of how the aim of medicine can be achieved. They are obsessed by something they call scientific methods, and look with envy upon those schools where laboratories have been provided with a lavish hand. They fail to recognise the absence of that spirit which makes of medicine a science apart from all others, and that medicine cannot be pursued on the lines that may suit other sciences. Take that ideal of training a professor of medicine which prevails in continental schools, particularly in Germany, as set forth in the writings of Flexner and in the evidence of Professor Müller. Here an innocent youth is guided from laboratory to hospital, and inspired by the idea that in this way he can be made a teacher. In course of time he does become a teacher, with an outlook on medicine cramped by his very limited opportunities, and he never realises that he, with his limited knowledge, is supposed to teach men who will go out into the world and see disease in form and degree undreamt of by him. The desire for change of method, with no clear perception of the object, is not progress. When this University of Edinburgh, following the modern notion of progress, separated from the Chair of the Institutes of Medicine—a chair for purely academic physiology—it was deemed a wise thing. But I want you to be sure of the wisdom. As an investigator in clinical medicine, my work has been hampered all along the line by an absence of knowledge regarding simple physiological problems.

The Opportunities of the General Practitioner to Medicine in General.—Consider for a moment who is the individual in medicine who has the opportunity for a broad outlook, and whose life-work gives him the opportunity of seeing all parts of medical science in its true perspective. It is the general practitioner. He sees the conditions which predispose to disease; he sees its inception and the course it pursues, passing from the signs for medical treatment to the time when it calls for surgical interference. He sees the after-effects of the operation after the surgeon has claimed it as a success. If he is stimulated to inquire into the symptoms of disease, he is brought into contact with every special department, and has the opportunity for estimating them at their true value.

Yet he has no say in medical education or research. If any teaching appointment falls vacant, by the fact that he is a general practitioner he is excluded. Supposing some young physician, with a desire to become a teacher, wants to spend, say, five years in general practice so as to see the diseases his students would ultimately meet with, and to make himself familiar with the opportunities of his future students, we know that such a step, which common sense would dictate, would, under the present conception, disqualify him for a teaching post in any school. I have shown that there are fields of research unexplored which hamper progress, which only the general practitioner can work. What is done for him in research? Money is poured out for research, but no one ever thinks of giving him a grant or instilling into him this aspect of research.

In undertaking this inquiry you will see the need of looking upon medicine with new light in your eyes and the need of a new spirit to guide medical knowledge into fruitful paths. I have been asked to give suggestions as to the methods, but having long studied this matter, I am certain that you cannot perceive the proper paths until you realise where lie the defects of the present. To borrow a simile from the realms of theology, before a sinner is fit for repentance he must be brought to a consciousness of his transgressions. Before you can attempt to reform medical education you must know where it fails, and until you thoroughly understand this the methods to be pursued cannot become clear. I would earnestly ask you, not to accept my views, but to inquire whether what I have said is true. Once you have grasped the aspect of medicine I have presented to you, I have no fear of the result.

Be not too sanguine of a speedy success in your efforts. Many difficulties will confront you, but if your work be honestly and thoroughly undertaken you will have lighted a torch that will illumine the whole realm of medicine.

II.—THE TEACHING OF CHEMISTRY TO STUDENTS OF MEDICINE.

By Professor JAMES WALKER.

In speaking on this subject I labour under the great disadvantage of never myself having gone through a course in Medicine. It might be well, therefore, if I stated at once what experience I have had in teaching medical students, in order that my qualification for dealing with the subject may be estimated.

My first experience of teaching medical students was in University College, London, where I taught not only Chemistry for the First Professional Examination but also Practical Organic Chemistry and Toxicology for the later London examinations. After being appointed to the Chair of Chemistry in Dundee I became a member of the Faculty of Medicine of the University of St. Andrews in 1897, and have since that time sat without interruption on a University Medical Faculty, and so have listened to discussions on medical education for twenty years.

In Dundee the number of medical students was small, and both in lecture and in the practical class these Medical students went through practically the same course as the Science students. There was always the possibility, however, in a small laboratory class, of drawing the attention of students to medical applications of tests and chemical operations which they were performing; so that, although no special training in medical chemistry was formally given to them, they had at least their eyes opened to the connections between the chemistry they were learning and the subjects which they would subsequently take out in their medical curriculum. During the later years of my stay in Dundee I had frequent conversations with the Professors of Physiology and Materia Medica, and thought a good deal about the possible adjustment of a Chemistry course for first-year students which should meet the requirements of these subjects. I became convinced that what the medical student wanted was more Organic Chemistry and less Systematic Inorganic Chemistry.

On coming to Edinburgh I lectured for the first year of my tenure of office to a class of students in the three Faculties of Arts, Science, and Medicine—a parallel course of lectures being given to women students who at that time belonged only to the Faculties of Arts and Science. The Medical Practical Class was taught separately from the First Year's Practical Class for Arts and Science. The experience of lecturing to a large class of the various faculties, including students of Arts, of Pure Science, of Agriculture, of Engineering, as well as of Medicine, convinced me of the absolute necessity of separating the medical students from the others and delivering a special course of lectures to them. A separation of the two elementary classes was carried out in my second year, and has been adhered to since.

In the Medical course of 100 lectures I have allocated the time in, roughly, the following proportions:—

General Principles of Chemistry . . .	about 25 lectures.
Systematic Inorganic Chemistry	about 30 lectures.
Organic Chemistry	about 45 lectures.

From the beginning I endeavoured to show the students the bearing of the principles and facts laid before them upon the subsequent courses in the medical curriculum. I have found it just as easy to teach the principles of Chemistry and Chemical System by drawing illustrative examples, as far as possible, from Medicine, as by adhering to the time-honoured examples of the ordinary text-books; and I have, by adopting the first method, certainly attained a higher level of attention, interest, and work on the part of the class than I ever did when I adhered to the conventional system. Of course my difficulty has always been the want of direct knowledge of the subjects of the later Professional Examinations. I have had to do the best I could by reading some of the larger modern text-books on physiology and pharmacology, with occasional excursions into books dealing with immunochemistry and clinical chemistry. My first object has been to take the student to a point, in Organic Chemistry especially, which will enable him to take up the study of Physiological Chemistry or of the chemical side of Pharmacology without experiencing the existence of any wide gap between his Elementary Chemistry and these subjects. To assist both the students and myself in attaining this end I have written a *Text-Book of Organic Chemistry for Medical Students*, in which I have gone a little further into the subject than I can possibly go in the course of the elementary lectures. Although I am convinced that I have been proceeding on the right lines in this matter, I am very conscious that much still remains to be done to effect the proper co-ordination of Chemistry with the later subjects involving its knowledge.

A course of Practical Chemistry should, as far as possible, run parallel with the Lecture course. Under existing conditions in Edinburgh this is impossible. One hundred students are packed together in a room which could barely provide accommodation for forty. The equipment is of the most primitive description and precludes the use of apparatus with which the elementary student should be familiar. It is quite impossible, for example, to carry out any experiments involving exact weighing—or indeed any kind of weighing at all. All that can be done, in addition to ordinary test-tubing, is an introduction to volumetric analysis, some simple preparations of salts, and some tests for common organic substances. With a properly equipped laboratory I should be inclined to drop test-tubing altogether, or at least restrict it to a minimum, and give the students practical work which would enable them better to appreciate the lectures.

It is no doubt known to you that an ordinance for the establishment of a Chair of Chemistry in its relation to Medicine is at present progressing by tedious stages to its reception of the Royal signature. Chemistry is now such a large subject and has so many ramifications that it is impossible in a large university for any one man to teach the whole of it, or even to be responsible for that teaching. Nearly every university in England has more than one Professor of Chemistry, and when the subject of dividing the chair was mooted here I strongly urged that the first division should be between medical chemistry and pure chemistry rather than between two branches of pure chemistry, as had been customary. The Medical Faculty here is so large and so important that the teaching of chemistry within it well deserves a head unoccupied by other duties who can devote his whole attention to the medical aspect of the subject. To my mind, the ideal to be aimed at is a Department of Medical Chemistry, which should be in close association with the Departments of Physiology, Pharmacology, Pathology, and Bacteriology, and in which the medical student should be taught not only his First Professional Chemistry, but the chemistry he requires in his later studies. If all this teaching were done in one department under one head, co-ordination and continuity could be absolutely secured, and the student would not have the unfortunate idea that after he had passed his First Professional Examination he was done with chemistry for ever, and that the Physiological Chemistry, for example, he met with in his second year, after a noticeable gap, was something altogether different from his First Year's Chemistry, instead of being a continuation and application of the same.

The difficulty of co-ordination is always great, as I have experienced even in trying to co-ordinate the Lecture Chemistry with the Practical Chemistry, and when two parts of essentially the same subject are taught by different departments the difficulties of real co-ordination in the student's mind are almost insuperable. For the purposes of examination it has been thought necessary to divide medical study into practically water-tight compartments, each of which is presided over by a separate head and has a separate organisation. The necessary result is, that in the student's mind his medical studies form, not a single whole, but a number of different and practically isolated parts. Until this point of view is eradicated progress in the teaching of medicine can only be very limited. In the future I think it will be necessary to give up the system of 100 lectures for a given subject in one year and 100 lectures in another subject the next year, and so on. These large courses will probably have to be split up into fragments, which must be pieced together again to form some kind of organic whole. Any attempt to carry out such a reorganisation will require a very thorough-going and difficult overhauling and recasting of the student's time-table. It may be practically impossible to reach a condition approaching the ideal, but at least enormous improvement on the existing state of affairs can be effected.

I have stated that I labour under the disqualification as a teacher of Medical Chemistry of never having gone through a complete course of medical instruction. Probably my successor will suffer from the same disability, as it is nowadays practically impossible to get a teacher who is primarily a chemist and at the same time a graduate in medicine. But my successor will have the enormous advantage of being able to devote his whole time to the study of chemistry in its medical aspect, and, by the system I have suggested, of giving all chemical instruction in the one department of which he will be the head, he would be brought into much more intimate contact with the teachers of the more professional branches, realise what their problems are, and, as far as they are of a chemical nature, endeavour to solve them. For unless the new department besides being a teaching department is a research department devoted to medico-chemical investigation, it will fail to each its full utility, even in elementary teaching.

DISCUSSION.

Dr. McKendrick expressed the opinion that from the point of view of applied radiography he did not see what could be added to the course of physics as at present taught to junior students to help them in the understanding of the X-rays. The practical working of the X-ray apparatus is quite a simple matter—purely mechanical work. The military hospitals are a proof of that; an orderly can be trained within a week to work the apparatus.

On the general question of the teaching of physics Dr. McKendrick thought that more attention should be paid to impressing on the student fundamental principles rather than details. As an examiner in physics he had found that the candidate often has an enormous amount of detailed information at hand, but as to the why and wherefore of it all he is rather lost. It is common experience that by the time a man is qualified to practise medicine he has forgotten a large proportion of his first profession subjects. This is largely due to the fact that he does not appreciate their importance in relation to his later work; the first-year student does not appreciate fully what physics or chemistry are going to be to him in his after life.

Professor Lorrain Smith.—I should like to say something on the question of the co-ordination of chemistry with the other subjects of the curriculum.

Professor Walker has introduced into our idea of medical teaching an extremely interesting conception of the relation of the subjects. Dr. Knott agreed with him in lamenting the separation of one subject from another, and I think all those who have had experience in teaching will agree with the remarks of both speakers on that point. Thus when there is a practical class and a lecture class in the same subject, you find it is exceedingly difficult to get the students to carry over to the lecture class what they have learned in the practical, and to apply in the practical class what they have learned in the theoretical one. The conception put forward by Professor Walker as to the ideal method of teaching chemistry was not to give a hundred lectures and then a course of practical lessons, but to combine a certain amount of lecture work and a certain amount of practical work together, the one illustrating the other, the co-ordination and continuity being carried out week by week. That principle he has applied still further. Not only should we co-ordinate the teaching of the practical and theoretical work in a given subject, but we should go a step further and co-ordinate the teaching of that given subject—in this case chemistry—with the teaching of other subjects. Professor Walker's method is to me a most illuminating, interesting, and original way of teaching chemistry. The whole curriculum of the medical student suffers essentially from the difficulties which arise from the water-tight compartment system of teaching. I would suggest that Professor Walker's conception should apply to physics also, and that Dr. Knott might deal with this point. In the early stage the teacher would give a general introduction to physics in the time available ; and later he should go on teaching the physics necessary for physiology and anatomy, for X-ray work in the interpretation of anatomical structure, and for surgery, etc., etc. That is, that he should teach physics, keeping in his mind the medical point of view. Comparatively few meetings would be all that would be necessary in the later years to keep the significance of the subject fresh in the mind of the student, and to illuminate the new subjects to which he was being introduced ; for the real difficulty is in breaking ground. It calls for all the initiative that the average student possesses to break ground in the subjects he has to take up in the medical course. A skilful teacher helps the student over this difficulty of initiative. Of course in text-books you get all the material which is required for teaching, or at least a very large percentage of it ; and what the teacher really has to do is to help the student over the difficulty of breaking ground.

Another point I would like to raise is one which I do not think any of the speakers dealt with. We are being bombarded by educational reformers who want us to turn the schoolboy into lines of early scientific study preliminary to medicine. That is a point which I think this club must take up very carefully when considering the early stage of the curriculum. It has been suggested in regard to chemistry and physics that if we could get the schoolmasters to take the burden off our hands, these subjects might be eliminated from the medical curriculum. We must keep in view the question of general education : I would advocate the extension of this in certain directions, and I would be very slow to urge the schoolmasters to displace the study of literature and general subjects, which are the proper work of the schoolboy period. I would leave the serious study of chemistry and physics to the undergraduate of the university.

Dr. Drinkwater.—I cordially agree with nearly everything that Professor Walker has said. My own feeling has always been that there should be a separate course of organic chemistry for medical students. Physical chemistry is also a most important subject; I should put it next to organic chemistry. It is a most difficult thing to make a student understand that the chemistry he is learning in his first year is going to be of any use to him afterwards. I suppose chemistry was originally put into the medical curriculum simply as an excellent science for training the powers of observation. Now it is part and parcel of medicine, but one cannot get the student to see that. He studies it simply to get through his First Professional Examination. Something might be done by an authoritative address to make the student see that he is learning chemistry as part of his medical study and not as a means to passing an examination.

In the extramural school we are up against another difficulty—that of teaching dental and medical students together, their aims and objects being quite different.

One can never teach chemistry in the lecture-room; it can only be really taught in the laboratory. The difficulty is to find the time.

As regards school work. I have had twenty-two years of teaching in a school, and certainly some of the boys have done very well—six or seven are professors in various universities—but I must confess I have felt myself a bit of a fraud all the time. I knew very well those boys had to pass the inspector. I knew what the inspector's little favourite things were, and of course I taught them to the boys! They were supposed to do little experiments and to draw deductions. But a boy cannot draw deductions; he has to be told what the deduction is he has to draw.

Dr. Rainy.—I think that all of us who teach subjects coming towards the end of the curriculum must feel the difficulty in certain parts of side-room work in clinical teaching. The men have got certain facts in chemistry, in physiology, in clinical medicine; but there has been no building of bridges, and the teaching of the one is in no way dovetailed into the teaching of the next. And whilst I do think that with the length of the present curriculum it would be impossible in any serious way to increase the total load upon the student, surely there might be a great deal of readjustment of the load with enormous advantage. It could be brought to bear on what after all is to be the life-work of the great bulk of the students. I quite appreciate the fact that in university and academic teaching we must do something more than train the students for their trade. We must stand for the higher teaching. We have a large number of men for whom, as taking their fees, we are bound to provide equipment for their future ordinary life-work outside academic centres, and I do not think we are doing that in the meantime.

In teaching physico-therapeutics, what I deplore is not so much the student's ignorance of the more remote parts as the want of grasp of the fundamentals. We must remember that when the student first comes to us he is very undeveloped, and it is only afterwards that he understands the value of the subjects in his course.

As regards teaching science in schools, I have never seen any very good results from the preliminary science teaching of boys before they come to university age. I feel that we ought to do more in the way of carrying on from the elementary to the more advanced subjects, either through the same teacher or through someone else who is very much in touch with the other teachers.

Dr. Kay.—We have heard a great deal to-night about the undesirability of attempting to teach the schoolboy science. My own experience is that I should have felt myself rather at a loss if I had had no instruction at school from a good teacher. I think that we are not yet in a position to assume that all our students have been well taught at school, but I should doubt very much whether under present university tuition conditions the student who has had no school teaching will excel, at least in, for instance, chemistry. I should like very much to know whether the students we have who do well in chemistry are those who came to the subject as an entirely new one, or whether they have, as a rule, already had a fundamental training at school.

I am quite in sympathy with what has been said about us teaching far too much in the course of the first winter. Something must be dropped.

Dr. Dingwall Fordyce emphasised the importance of impressing upon the student at the very beginning of his studies the interdependence of the different subjects of the course, and particularly the bearing of the more purely scientific subjects on clinical work. Without this the beginner has no conception of the ramifications of medicine. This might be done by means of an introductory address by an eminent clinical teacher, who would arouse the interest of men who are taking up medicine as their life-work, and give them some conception of what the study of medicine implies.

Dr. J. S. Fraser.—What has been said shows that we must go back to an earlier stage than the first year of the medical student—to the school curriculum. English often forms a very small proportion of what is taught at school. Far too much time is taken up with Greek iambics and Latin prose. I think that in this discussion we ought to call attention to the fact that the modern school education is anything but satisfactory for the schoolboy of 17 or 18 as an introduction to medicine.

It is desirable to spread such subjects as chemistry and physics over the whole medical curriculum, so that when the student comes to diseases of the eye, say, he should know something about optics, and when he comes to diseases of the ear he should know something about acoustics. The student would then receive the information at a time when he would appreciate its importance, whereas in his first year he fails to see that it has much connection with his subsequent career.

Dr. Taylor.—I happen to have been one of those unfortunate individuals who inspect the teaching of science in schools, in addition to teaching in the university. I may say that the teaching of science in schools has changed very considerably since Dr. Drinkwater taught in schools. It is done in quite a different way in a great many schools, and it is almost invariably the opinion of headmasters that the boys best at other subjects are those who are best in science. In visiting the greater number of secondary schools in the southern district of Scotland and in conversing with the headmasters and teachers whilst examining the boys and girls, I have formed a strong opinion that the scientific side of the school is the best side nowadays, and it is my experience that the boys and girls I have examined in previous years at school and noted as being very good in science are those who have figured pretty well in the honours list of the university. I think it is the fashion to run down the teaching of science in schools just now, especially among those who are interested in medical education. This seems to me very unfortunate. The time given to science is usually taken from Greek, so that the boy taking science gets the same English education as the other children. I am sure everyone who has taught science in the university, especially to medical students, knows that there is a very real difficulty in making them realise the importance of science and in getting them to understand that when they have done with physics in the first year they have not done with it for ever.

I think only those students who have had a reasonable education in science at school have much chance of knowing anything about it at the university. The only hope of progress lies in Professor Walker's suggestion of co-ordination, and that teachers of physics should have a further opportunity of holding classes after the first year. As a university teacher I can say that my experience as an inspector under the Scotch Education Department did me a world of good, in that it showed me the kind of work they were doing in the schools and revealed the gaps and overlappings between school and university teaching. I am sure it would be of benefit to both if the university teacher knew what his pupils have been through before they come to him.

PROFESSOR RITCHIE.—The discussion we have had to-night already justifies the club in inaugurating what I hope will be a very serious task of this winter. In the discussion of two elementary subjects we have come up against fundamental principles, and it is obvious that there are a great many difficulties with regard to these principles which we will have to face. The question of the preliminary education of the students who come to the university is one of these fundamental points, and one which I think this club will have to take up more in detail. I think it will be necessary for us to have some conference with the authorities in preliminary education as to the part which school education can play in preparing for the medical curriculum. It seems to me in regard to this matter that the water-tight compartment of which Professor Walker has spoken has operated very detrimentally. There has been no proper co-ordination between the people who are responsible for arranging the preliminary education and the people responsible for carrying on and elaborating that education in the training for the medical profession. We have to face the fact that we are not only dealing with boys and girls who have been subjected to the Scotch educational system, but also with those who have gone through a certain preliminary education elsewhere. It is practically impossible to devise an advanced course of instruction suitable to the requirements of all the various classes of students who come here, and I think, in the first place, that we should lay down the fundamental principle that we are to adjust our university courses to the requirements of Scotch boys and girls—and if possible English boys and girls—and leave the others to see that they have to come up to these requirements. The tendency is to raise the school age and to have students coming up to the university at a more advanced age than hitherto.

With regard to science, the question arises—At what age can science begin to be properly appreciated? That, too, is a fundamental point. I do not think that up to the age of 16 or 17 the average boy or girl is capable of drawing the deductions necessary for the proper understanding of science.

I think everyone will agree that the recent work done by Professor

Walker in bringing to the forefront the necessity of having a special teacher of chemistry devoted to medical students is going to be of the highest value, and that it gives us in the meantime an outline of how a preliminary subject can be carried right through the course. Perhaps the scheme would be more easily applied to chemistry than to some other subjects, because I think the student will appreciate more readily the universal bearing of chemistry on all his work than the universal bearing on it of the other individual subjects. He sees, for one thing, in the curriculum that he has to attend courses of physiological chemistry. I hope that he will soon see that he has got to attend courses in more advanced chemistry, or, rather, later courses in chemistry, which will deal with the clinical and pathological sides of chemistry.

I should like to hear how the subject of physics should be expanded, and how far the suggestion thrown out that as in chemistry so in physics, in the later parts of the course, particular aspects of the subject should be dealt with.

Of course the whole curriculum is rendered difficult of approach from the fact that you cannot get out of the mind of the student the idea that the be-all and end-all of attending classes and going through courses is the passing of examinations. That is another fundamental question that we must face in this discussion. I think that Professor Lorrain Smith will agree that when they come to pathology the students are still as elemental in their views as when they come to chemistry. They do not appreciate the difference between education and the passing of examinations.

Professor Russell.—I should like to say a few words on what we have heard about the co-ordination of physics and chemistry with anatomy and physiology. The practical outcome of such a scheme would seem to be that more attention would be paid early to anatomy and physiology and, if I understand Professor Walker aright, to take in a certain amount of more advanced chemistry along with physiology; and that physics would come in to a certain extent in physiology but would be taken also in later subjects of the curriculum. As a teacher in one of the more advanced subjects I sympathise with almost everything that has been said. It would be a great gain if the student could be carried on in that way to the important departments of science as now so definitely applied to practical medicine. Of course we have to be careful not to overload the student, but there is no doubt that the trend of modern education has been to make him desire to get up tables and pure memory work. The average student, so far as I know him at present, very much objects to having to think about things. I have spoken about this with many educationalists, and they have assured me that I am not mistaken. Indeed, I am amazed at the development of the modern memory. From school-work it has been carried on into medicine, and the student wants to have a certain definite set of things that he must know in chemistry or physics, or any other subject; he does not want to think about them at all. That, of course, touches the important matter which Dr. Drinkwater dealt with—the teaching of principles and the getting of students to look at and understand their subjects and to make deductions from what they see. I also account for the student's attitude of mind, at any rate in the earlier stages of the curriculum, by the new system of examination. When I was studying medicine we had to attend for two summers and a winter or for two winters and a summer before we were allowed to go up for any examination. If we began in summer we had botany and zoology, and we could not go up until the end of the next summer, with the result that we went over these subjects again during the second summer, the outcome being that we undoubtedly carried away with us certain principles at all events and a certain amount of broad knowledge that we have never forgotten. Think of what happens now. A boy leaves school, and begins his medical course in summer with botany and natural history. At the end of ten weeks he is expected to pass in botany and natural history; and he does so. What could happen but that he should forthwith cast them and forget them completely!

Mr. Miles.—It is very fortunate that thus early in our discussion we have taken up the line of co-ordination of subjects. Such a scheme would to some extent break down the water-tight compartment arrangement; it would no longer be water-tight if the professor of the first year had a part to play in the second, third, and subsequent years. Co-ordination of this sort would to some extent do away with the difficulty of school education in scientific subjects. The question of the examinations is also important, because to the student the examination is the essential point, and until we can get rid of that idea little can be done. We must consider in what way we can modify the examinations so that they shall be a real test of the student's knowledge right through his course. There are various ways in which this could be arranged, but this is not the time to discuss them.

Professor Robinson.—One thing that comes out of this discussion is that everybody is agreed that water-tight compartments must go. It is perfectly obvious how they began. To arrange examinations and time-tables was the easiest way of making a curriculum; and it is possible to get more memory work into a given number of weeks if you make water-tight compartments than it is if you spread the work out into a dovetailed curriculum. I agree with everything that has been said about the dovetailed system and with everything that has been said about the preliminary education through which our students go before reaching the university; I am in absolute disagreement with the idea of any preliminary scientific education for medical students. I agree that medicine is purely utilitarian, but I disagree that you must start with principles straight away. I think that what is now preliminary should come later. You must start from something the man knows. There is no use in discussing general principles with him—he does not know what you are talking about. But if you teach him to appreciate what he does know about himself and then pass on to the explanation of the phenomena of that which occurs within himself, enlarging his scientific conception of what he knows, then to my mind you will have begun in the only right way. Having brought him up to pathology, anatomy, etc., we should pass back to zoology and other earlier subjects, and explain how each subject affects and bears upon the other. Taught in this way he will take an appreciative interest in the matter. If I talk to him about muscles or bones, and tell him that certain things will happen if these are broken, he will appreciate it at once. Dr. Knott's levers and other forms can be explained on those lines. I think that, going on those lines, we would get far more out of the student than it is at present possible to do.

Dr. Edwin Bramwell.—We who are teaching the student just before he graduates ought at any rate to realise what he requires to know in his profession afterwards. I think the lack of this knowledge is perhaps the fault of the clinical teacher, and I think that if clinical teachers met together and formulated certain ideas of what they want the student to know before he comes to them much might be gained.

Dr. McKendrick.—In our curriculum it would be an advantage if those lecturers who are teaching towards the end of the course could say to the earlier lecturers, "The men you send up to me must know about so-and-so. I want them to understand this and that in anatomy, physiology, pathology, and so on." With such intercommunication among the lecturers and teachers from the final year downwards those of the first year would have a better chance to prepare the student for what he is coming to in his later lectures.

Dr. Sillar.—I have had peculiar opportunities of forming opinions on this subject of co-ordination among the lecturers, because the subjects that I have had to teach touch in many points on the teaching of the First Professional subjects, and perhaps I may be excused for saying in passing that of late years it has struck me forcibly that the equipment of the average medical student in chemistry shows a much higher level than it did in the years when I first began to teach. I think that this was coincident with Professor Walker's appointment to the Chair of Chemistry, and I am sure that, owing either to the way in which he treats the subject or to some power of his own of really impressing students with the importance of chemistry, we do not now get the same ignorance with regard to fundamental chemical facts which was an ordinary experience when I began to teach.

I also have been impressed with the medical student's inability to observe. He cannot observe, and when he tries to he cannot record his observations in accurate language. The point, I think, has to be faced as to where in his curriculum this fundamental part of a student's training must be laid down. I sometimes find, for instance, that they have not an elementary knowledge of how to weigh ; they never have weighed, they do not know the method of manipulation of a balance. Further, in reading the cases taken by the students in the Infirmary, I have found the same want of power of observation. I have also had rather a peculiar opportunity of investigating the question of examinations and the interest a student takes in his work, because it is my fortune to teach a class in which there are no examinations, either class or professional. The only men who ever take the class of experimental pharmacology are men who really want to learn something about this particular subject. Although there are very few men who take it, I have never had to complain of want of interest. And I think—I do not know if it is a counsel of perfection—that if we were able to omit the examinations and to a large extent to pass students from one subject to another on the knowledge that the teacher has got of their work while it comes under his particular care and observation, we would gradually eradicate that extraordinary point of view which one is always running against, that the student is not only preparing for an examination, but that the examination is one long-continued piece of elaborate trickery. One tries to get rid of this idea and to impress upon the student that when one asks him a question which has a reasonable answer it is that answer one wants. But the more elementary the question the more will a student hesitate to answer, because he cannot believe that he is going to be asked a question with a reasonable answer. I think that this water-tight compartment system—where each examination is a milestone upon which the mental view of the student is fixed and on passing which he breathes a sigh of relief—vitiates from the beginning his power of mind, so that he cannot appreciate why he is learning the different subjects. There is no doubt as to the advantages of the correlation of the teachers.

Mr. Jardine.—In the Surgical Out-Patient Department I see the student in his second year when he first comes into contact with the living person in the hospital, and he shows extraordinary interest in the patients and a keenness to learn everything about them. Then he leaves for a year to work at the subjects of his Second and Third Professional Examinations, and on his return to hospital in his third or fourth year his outlook as regards the patient is completely changed ; he takes little interest in him. Is there no way in which we can bring the student at an earlier period into contact with the patient and carry that on throughout the years until he qualifies ?

Dr. Byrom Bramwell.—This discussion shows how difficult the subject is, and how difficult it will be to make alterations of a practical nature which will not only improve the teaching of medicine but will please individual lecturers and teachers.

The first fundamental point which ought to be considered when approaching a discussion of this sort is : What is the object of medical teaching ? I take it that the object is to turn out medical men who are able satisfactorily to practise their profession. This great University of Edinburgh has always been a teaching centre of that kind, aiming at turning out practical medical men rather than researchers and professors. Of course it is important at the same time to aim at still higher teaching for men who show the ability and the wish to profit by it. But this certainly is not the *main* object of medical education. Thus we have great difficulty in so co-ordinating the curriculum that it will suit the average medical student, and at the same time teach the men who are aspiring to higher things. We must look at this as practical men, and consider the class of students who come up. The average man has only average abilities, and the higher teaching for him is quite wasted. Of course the ideal thing would be for everybody to be a complete chemist, a complete physicist, and then to begin the study of practical medicine. But life is short, and it is impossible to attain this, so that all that we can do is to endeavour to make a practical course which will be fitted to the average student, and will at the same time stimulate the more intellectual man to do better things afterwards.

I should like to see botany and natural history completely done away with in the medical curriculum, and passed before a man came up to the university. The average student cannot possibly grasp in the time at his disposal all that he has to undertake. I would like to see a great number of the systematic lectures done away with ; more attention even than at present should be paid to practical work in the laboratory and in the hospitals.

The lecturer ought to emphasise the important points in those scientific subjects which are going to be of use to the medical student afterwards.

For each of the subjects there ought to be a certain series of subjects drawn up, and the student should be told that those are the subjects on which he will be examined. The object in teaching the preliminary sciences is to make the student learn something that he will remember all his life and which will be useful to him in the future practice of his profession as well as in learning it. Instead of examining a student over the whole range of a subject, emphasise certain things and tell him these are the things he *must* know. In medicine itself an enormous amount of superfluous and entirely useless matter is taught. If the student meets a rare case he has his text-book to go back to. Let him know certain things well rather than the whole imperfectly. This must be settled by a consultation of teachers who know what is wanted, and who will be able to judge of the relative importance of each subject. I was very much interested in Professor Walker's suggestion of co-ordination.

The subject is of great importance, because I take it we are not trying to legislate for this school alone, but are trying to lay down an altered system of medical education which will be a real improvement all over the country.

Professor Walker said in reply—With regard to my experience of the value of school instruction in chemistry, if you look at the list of first-class honours' men you find that the majority have had previous instruction in school, no doubt, but when you take the class as an average, I am not so sure about school education. On one occasion I had a particularly large class in chemistry—for Arts and Science, not Medicine—and I ascertained from direct inquiry the number of years of school chemistry each individual had had. I divided the class into two sections—those who had had over three years and those who had had under three years at school—and in the end there was very little difference in their work.

I should be prepared, if I had the proper laboratory, to drop nearly all the lectures and make the instruction almost entirely practical.

One of the great drawbacks of the hundred lecture system is that the instruction is far too concentrated. It is really marvellous what the average medical student learns of chemistry in five months. But he would learn to very much better advantage if the same lectures were delivered over a longer time. I know that by experience. I have two classes—a normal elementary one for medical students and one for science students. The medical class is compressed into the winter session ; the three times a week science class spreads over three terms, and there is no doubt that the science people do very much better on the average than the medical people. If we could arrange our medical curriculum more on these lines, even without the co-ordination I have suggested, a far more satisfactory result would be obtained.

III.—BOTANY IN MEDICAL EDUCATION.

By Professor BAYLEY BALFOUR.

I TAKE it the object of your discussion is, by carefully reviewing the whole medical curriculum, to find out whether the student during the all too short time that he is at the university really employs his time to the best advantage, and whether, always bearing in mind that the medical degree is something more than a mere technical licence to practise, by any rearrangement of the curriculum—by reduction or excision of subjects, or by other methods—it may be possible to give the student a more advantageous training than he has at present for the great profession on which he is about to embark. I shall say a few words on the subject of botany in this connection.

All questions of improvement of education and training resolve themselves into one of matter and one of method. And in considering the subject of botany in relation to medicine one has to recognise that there are certain branches of it which are more directly and practically useful to the medical student—the equipment branches we may call them—and there is the broad fundamental educational side.

As regards *matter*, there is no doubt that the equipment branch brought botany into the medical curriculum. Some years after the physicians had founded in 1670 the Edinburgh Botanic Garden in order to teach practical materia medica, the university introduced botany as a Chair—the foundation chair of the medical faculty. Since then things have marched far, and materia medica has hived off from the main subject of botany and is more effectively taught at a more advanced period of the student's curriculum by the professor of materia medica. At the end of last century another equipment branch came to the fore—bacteriology. How short was the view taken by the University Commissioners of the progress of medicine when they not only refused to institute a lectureship to deal with bacteriology in my department, but also refused assent to a scheme through which teaching of bacteriology could have been provided in another way. In consequence of the peculiar relationship between the university and the Botanic Garden the Treasury, after inquiry by a committee, agreed to the proposal under which the Treasury would maintain the botanical teaching of the University of Edinburgh in all its branches, provided that the university would transfer the fees of botany students to the

Government. The negation by the commissioners of this proposal was, I am afraid, prompted by financial rather than by educational considerations. And so it is only, as you know, within very recent years that a Chair of Bacteriology has been established, and I, too, have a lectureship in my department. But bacteriology can be taught in my department only as part of the whole subject of fungi; the pathogenic side cannot appeal to the medical student until a much later period in his curriculum.

Equipment branches tend to hive off from the main subject as these have from botany, and who shall say what other subjects in connection with plant life will in future bulk more largely in relation to medical education; doubtless they too will hive off to the control of independent lecturers. After removing all these equipment branches you have still the broad educational side of botanical teaching—the knowledge of plant life—to put before the medical student. The method of presentation of this must always be a reflection of the personality of the professor for the time being, but his teaching must deal essentially with the broad facts of plant life as part of the environment of man, and stimulate the imagination of the student by interesting him in the great problems of evolution and in the fundamental facts of inheritance and heredity generally. In all this there is ample material of direct use to the medical student, apart altogether from the educational value of the study of such a subject as botany at the outset of a boy's university career, fresh as he is from school, where he has been impressed by authority and has not had to deal with evidence.

As regards *method*, I would, in the first instance, point out as a handicap under which the majority of medical students suffer in the study of botany the lack of knowledge of chemistry and physics. When one endeavours to present to him a picture of the green carpet of the earth as the great circulator of carbon, or of fungi as circulators of nitrogen, the boy who has never heard of carbon or nitrogen gets a very imperfect impression of what one wants to convey. And the boy who knows nothing of barometric pressure or of osmosis cannot really appreciate the work of plant life. I am strongly of opinion that an important change—though I do not suggest how it might be brought about—in our curriculum would be one ensuring that all boys coming to study botany at the university have some knowledge—very elementary perhaps—of chemistry and physics. If school education be improved, perhaps the alterations in it would suffice for this purpose.

In view of overcrowding of the curriculum, it has been suggested that botany and zoology might be combined and taught as one subject —biology. There could be no greater mistake. The term "biology" was introduced into education by Huxley about the sixties of last century for a course instituted for the purpose of teaching science students going on to a further science curriculum, and it occupied a full year, and when I tell you that the assistants Huxley enlisted in the service of his course were Burdon Sanderson, Michael Foster, William Rutherford, Ray Lankester, and Thistelton-Dyer, I think you will recognise that that course was far beyond anything implied by the term "biology" when used to designate a substitute in medical education for the two subjects of botany and zoology. Biology was introduced in many institutions as a substitute for botany and zoology; I am disposed to think that financial rather than educational considerations led to this—it saved a Chair. The practical outcome has been that the biological teaching in these institutions has been divided between a botanist and a zoologist; and now in some cases there has been reversion to separate and independent teaching. Apart altogether from this failure in practice, I hold that biology is a bad name for such a course; it does not mean what it implies. It confuses real issues, because the plant organism and the animal organism in the higher grades are absolutely different; and whilst the laws of life are the same everywhere, the special relationships of the plant and of the animal organism to its environment and to everything else are of a different character. I would say, therefore, that if the time given to botany and zoology must be reduced, let it be done by halving each course and let each go on independently of the other, rather than hybridise them under the name of biology.

It has been suggested that the medical curriculum might be relieved and more time released for other subjects were botany and zoology relegated to school teaching. That is a very important point, and one that has come prominently forward recently. The Medical Council some years ago spoke of it. If you ask me, Could botany and zoology be taught in schools just now? I say emphatically, No. There are no teachers, there is no equipment. After the war the teaching of science will, without doubt, be largely introduced into our secondary schools —to what extent no one can say at present. It is significant that in all these years of dominant humanistic education Greek has not become a subject in all school areas. I am of those who hold that science teaching in schools ought to be primarily observational; the pupils should learn about what they see in the earth, the sky, and the sea, and something about the inhabitants of these and the relationships between them. I think that systematised laboratory work and teaching in botany should only be introduced at the end of a boy's period at school; even so, the atmosphere of the school is not nearly so good a one for such teaching as that of the university. If, however, the organisation were perfected, if the equipment were adequate, if the teachers were adequate, and if sufficient time without injury to other essentials could be obtained for the teaching of botany at school just before the boy entered the university, the question of relegation would require grave consideration. The teaching could only be introduced for pupils of a leaving age and would have to be so co-ordinated with the teaching of other science that the boy's time would practically need to be given over to it. Where is the advantage? It is better to send a boy straight to the university than to give him a whole year's science teaching in the last year at school. He will get a wider outlook on science at the university than he will at school. While I am willing to consider any schemes for the school teaching of botany that will suffice for the medical student when all the provision is made for it, I cannot but think that on general grounds it would be essentially a retrograde step. It would tend to narrow the student's view-point, and he would enter upon his medical career much less well equipped than he is at the present time.

Another consideration is, that the first year of medical study in our university—given to what we call the foundation science studies—is of the greatest value to the medical student in shaking him down to university study. At present, a boy entering my class will ask, How much have I to learn for to-morrow? He has yet to rid himself of the idea that he is still working under direct tuition and to realise that for the first time in his life he is free to observe and to look out upon his surroundings untrammelled by any doctrines or any authority that has previously been imposed upon him.

My own view is that we need another year added to the curriculum. When you consider the grave responsibilities that a medical man has to face in his work, and when you consider the relative importance of medicine and other professions, most of which require five years for qualification, surely a sixth year would not be too much to ask for medical students.

IV.—THE CONNECTION OF ZOOLOGY WITH MEDICINE.

By Professor J. COSSAR EWART.

Very little has been said in Scotland as to the connection of zoology with medicine, and, except in the writings of Huxley, the subject has received little attention in England. It is admitted on all hands that would-be healers and preventers of disease, before beginning the study of the purely professional subjects of the medical curriculum, should have the advantage of a liberal education. It was long assumed by many that a liberal education could only be obtained by the study of classics—mathematics, physics, literature, and philosophy. One of the main objects of education should be so to develop the brain that when maturity is reached the output of brain work will be as great as the structure and composition of the brain renders possible. It is being more and more realised that we differ as much mentally as we do physically, and that brains of a very high order may fail to respond to the stimuli of either classics or mathematics and yet respond immediately and effectively when, *e.g.*, biology is substituted for mathematics. As it happens, the attitude of many educationalists has fortunately been so profoundly changed since the war began that the time may not be far distant when no Arts or Science curriculum will be considered complete unless it includes biology, and when a medical degree will only be conferred on students who have previously taken a degree in Arts or Science. When this time comes it will no longer be necessary to consider the connection of biology with medicine.

In Edinburgh it seems to have been possible from the outset to graduate in Arts without professing any acquaintance with biology. On the other hand, in Oxford and Cambridge it is impossible to graduate in Medicine without first obtaining a degree in Arts, which includes among the subjects professed botany and zoology. Further, until a few years ago all Arts students in Aberdeen were required to study and to pass an examination in zoology. Huxley, in his rectorial address to Aberdeen students, expressed satisfaction with the inclusion of zoology in the Arts curriculum, and I often heard Matthews Duncan assert that the course of lectures on natural history in Aberdeen did more to develop his brain than all the other subjects of the Arts curriculum. Though Huxley was always dilating on the advantages of a knowledge of biology, and pointing out that zoology more than any other subject helped one to understand man's place in Nature, he is often quoted in support of the view that zoology should be reduced to a minimum or banished altogether from the medical curriculum. In an address delivered in 1854, Huxley, after pointing out that the systematic teaching of biology cannot be attempted with success until the student has attained a certain knowledge of physics and chemistry, proceeded to say: "Biology needs no apologist when she demands a place—and a prominent place—in any scheme of education worthy of the name. Leave out the physiological (*i.e.* biological) sciences from your curriculum and you launch the student into the world undisciplined in that science whose subject-matter would best develop his powers of observation."

In 1870, Huxley discussed medical education at University College. In 1870 he was advocating the teaching of physics and chemistry in elementary schools, and perhaps dreaming of crowds of students flocking to South Kensington to study zoology by way of putting the finishing touch to their general education. In the University College address Huxley said: "I have no doubt that botany and zoology ought to be got rid of as branches of special medical education; they ought to be put back to an earlier stage and made branches of general education."

Eleven years later it fell to Huxley's lot to address the International Medical Congress. After referring in this address to the important part played by parasitic organisms in the etiology of disease, he said that there could be no question as to the value of the connection between medicine and the biological sciences; that the future of medicine depended on the extent to which those who occupy themselves with these subjects are trained in the methods and impregnated with the fundamental truths of biology, and he concluded a weighty and impressive oration in the following words: "I venture to suggest that the collective sagacity of this Congress could occupy itself with no more important question than with this: How is medical education to be arranged so that, without entangling the student in those details of the systematist which are valueless to him, he may be enabled to obtain a firm grasp of the great truths respecting animal and vegetable life, without which, notwithstanding all the progress of scientific medicine, he will still find himself an empiric."

To be in a position to understand Huxley's attitude in 1870 one must bear in mind that at that time the course of zoology at University College was somewhat antiquated. One of Darwin's fellow-students in Edinburgh was Robert Grant. Darwin often accompanied Grant to collect animals in tidal pools and to hear on the way much about evolution as conceived by Lamarck. In course of time Grant was appointed Professor of Comparative Anatomy and Zoology in the

University of London. Unfortunately Grant, after settling in London, to use Darwin's words, "did nothing more for science," and, more unfortunate still, he lectured to students on comparative anatomy. Of the course of 60 lectures published by Grant, 15 were on the osteology of vertebrates, 8 dealt with organs of motion, 5 with the nervous system and sense organs, 20 with digestive, circulatory, respiratory, and secretory organs, and 12 with the organs of support in invertebrates. It is hence not surprising that Huxley in 1870 said at University College that zoology should be got rid of—"that it was in fact a downright cruelty to require from gentlemen who are engaged in medical studies the pretence . . . of a knowledge of comparative anatomy as part of their medical curriculum."

Huxley, it may be mentioned, was making arrangements in 1870 to give his first course of practical zoology. Rolleston, partly inspired by Huxley, had just published his epoch-making work on *Forms of Animal Life*, and already in 1872 the type-system of teaching zoology, so intimately associated with Rolleston and Huxley, was causing considerable stir amongst biologists in London. Huxley's course on practical zoology at South Kensington (conducted with the help of Michael Foster, Burdon Sanderson, and Ray Lankester) proved the forerunner of a course at University College of experimental physiology. At the beginning of the nineteenth century teachers of physiology as a rule devoted their time mainly to the practice of medicine—Hughes Bennett, *e.g.*, is oftener referred to as a physician than as a physiologist. A striking exception was Dr. Sharpey, an Edinburgh extramural teacher, who in 1836 was appointed Professor of Anatomy and Physiology at University College, London. According to Lister and other distinguished pupils of Sharpey, all that was needed to make the physiology course at University College an ideal one was a laboratory for experimental physiology. But in the majority of the London schools, according to Huxley, physiology, even in 1870, was "taught as if it were a mere matter of books and hearsay." As an examiner, Huxley expected a real, precise, thorough, and practical knowledge of fundamentals, whereas most of even the best candidates gave him "a large, extensive, and inaccurate superstructure." Soon after Sharpey resigned in 1874, a course of experimental physiology was instituted by Michael Foster, and soon raised to a high standard by Burdon Sanderson. Soon after practical physiology courses were established, physiologists urged that the course of zoology for medical schools should be limited, or all but limited, to the study of the animals made use of in the physiological laboratory.

In course of time the type-system of teaching zoology was ridden to death; it led to cramming and to the production of biological parrots who believed that a knowledge of the structure of a few types entitled them to assume that they had a firm grasp of the great truths respecting animal life.

For centuries physicians had little or nothing to do with zoological science, and zoologists concerned themselves but little with medicine. But towards the close of last century, as the result of the combined efforts of physicians and biologists, many important and unexpected discoveries were made which served to establish for all time a close connection between zoology and medicine.

Dr. Ashworth, who will in future be mainly responsible for the invertebrate part of the course of zoology for medical students in Edinburgh University, has been good enough to prepare a statement indicating the part protozoa and other animals play in spreading disease. In this statement Dr. Ashworth says:

"Nowadays zoological work has assumed an importance in relation to human well-being that transcends anything which could have been thought possible twenty-five or thirty years ago. Few would then have ventured to predict, for example, that the study of the anatomy and stages of development of dipterous insects would prove to have an important bearing on medical work, but in these later years we have come to know that many of these insects exercise a profound influence on the health of the community, not only in tropical countries, but also, though to a less extent, in Britain. We have only to think of the mosquitoes as carriers of malaria, filaria, and yellow fever; phlebotomus as the carrier of three-day fever; tsetse flies and sleeping sickness; fleas and plague; flies as carriers of dysentery and typhoid; lice as carriers of typhus and relapsive fever, and possibly also of trench fever—a formidable list which shows at once the importance of a knowledge of the habits and life-history of these insects.

"Moreover, it is to be remembered that in the case of some of the diseases mentioned the organism is either unknown, *e.g.* trench fever and yellow fever, or almost impossible to destroy after it has gained entry into the human body, *e.g.* sleeping sickness. Hence the measure of protection afforded depends entirely on a knowledge of the life-history and habits of the insect carrier, in which case the problem is in the domain of zoology—call it medical zoology if you like, but it is zoology more than medicine. The advances in our knowledge of such matters made possible the building of the Panama Canal and many other enterprises in the tropics which even a generation ago would have been impossible.

"In many other branches of medical work the influence of pure zoology is manifest—for instance the discovery of the spirochæte of syphilis and the recent rapid elucidation of bilharzia disease in Egypt, and observations on the life-history of the nematode ankylostoma and its mode of entry into man, not only by way of the mouth but through the skin, which have led to fruitful work on other worm parasites of man.

"Entomology, protozoology, and helminthology may now be regarded with bacteriology as well-established branches of preventive medicine, and practical sanitarians now take account of insects and certain worms and, as far as may be, devise measures for their reduction. The experience of recent years shows that the more we come to know of the structure, development, habits, and relations of animals—invertebrates as well as vertebrates—the more we realise at how many points they throw light on medical problems and in how many ways animals make contact with the lives of men."

I fear I have already trespassed too much on your time, but before sitting down I would like to say that our medical students should not only be able to read with profit the *Origin of Species*, but should have some acquaintance with the laws of heredity—know enough, for example, to realise the part played by the environment, that nothing can radically alter the composition of the germ-cells, and that, notwithstanding Lamarck and his followers, there is no clear evidence of the transmission of acquired somatic characters.

DISCUSSION.

Professor Robinson.—We have heard from Professor Balfour a very definite statement of opinion as to what should be done with botany in the medical curriculum. He thinks it should remain a university subject and not be taught in schools. I want to ask Professor Cossar Ewart whether he thinks zoology should be taught in schools.

Professor Ewart.—An ideal arrangement would be for the student to take both botany and zoology before beginning the study of medicine, or, better still, for medical students to take a degree in Arts or Science, two of the subjects being botany and zoology. At Oxford and Cambridge medical students must obtain a degree in Arts before they can graduate in Medicine. As botany and zoology are taken as part of the Arts curriculum, the arrangement at these universities is an ideal one. Shortly after Lister returned to London he paid a visit to University College to see the museums then under my charge. During this visit Lister, talking about medical education, said he had come to the conclusion that from every point of view it was better for students not to begin the study of medicine until they were twenty. He also believed that at least a part of the course of zoology should be studied during the third year, that there were many subjects dealt with by the professor of zoology which had a direct bearing on medicine, subjects the value of which could not be appreciated before some progress had been made in the study of pathology.

With regard to my own subject, I wish to say that, for teaching zoology in Edinburgh, increased accommodation is required and a greater amount of time in which to do the work. When I came to Edinburgh all that was required was a course of lectures, and that continued for many years. To attempt to teach any such science by lectures alone is ridiculous. Before I came to Edinburgh a mere handful of men did any dissecting at all. In almost every other college in the country zoology occupies more time than it does here. Our students have no time to make drawings of their dissections, and many dissections are of little use unless drawings are made. The course we gave last winter was the best given since I came here. The work was spread over three days a week during five months, instead of being crammed into ten weeks. The students had thus time to think over their work. Not only had we more time, but the most of the lectures on invertebrates were given by Dr. Ashworth. The result was entirely satisfactory, and I am glad to say that in future Dr. Ashworth will give in summer as well as in winter the lectures dealing with the subjects in which he is an expert. In the case of medical students not intending to take a degree in Arts or Science there ought to be a year set apart for the study of two or three of the subjects of the First Professional before the study of the Second Professional subjects begins.

DR. J. H. ASHWORTH.—Professor Ewart and I are emphatically of opinion that zoology for medical students should be taught in the university. Reasons already given by Professor Balfour in support of his opinion that botany should be taught in the university apply equally to zoology, and to these may be added the further advantage of continual contact between the teachers of zoology and those of the later subjects of the curriculum.

We consider that it would be better for the student to acquire a general knowledge of the structure of animals, as he does in the lectures on zoology, and, in the course of practical zoology, a personal acquaintance with the main structural features of a series of selected animals, including at least two relatively simple vertebrates, before entering upon the minutiæ of human anatomy. Therefore we hold that the student should finish his course of zoology before beginning human anatomy.

We are further of opinion that certain changes in the nature and scope of the course in zoology would be beneficial. We should like to be able to introduce into the practical course at no distant date more microscopic work, especially upon living objects, *e.g.* protozoa, segmenting eggs, chick embryos. The study of living organisms exerts a strong stimulus on the powers of observation and constructive imagination, and a well-considered course of practical zoology, which includes carefully chosen living examples, can arouse and foster these two powers in the young student better than anything else I know. Certain prepared objects and sections should also be examined, including material showing nuclei at rest and in division, after a study of which the student would be able to understand more clearly the discussions in the lecture course on some of the interesting problems connected with the chromosomes.

The chief aim of the lecture course in zoology should be to put before the student the main facts in regard to the structure, origin, and development, the habits and the adaptations to environment of a limited number of carefully selected examples as a basis of knowledge of the groups to which they respectively belong, the interesting features of the group being dealt with in broader fashion. The course should also include an elementary introduction to the study of heredity. These are the problems which are going to engage the medical student in regard to a special example, and if a lively interest can be aroused in them during the first year the student will be a better medical man.

The practical work should, as I comprehend it, be directed with the aim of giving opportunity for personal verification of the main structural features of a series of selected examples.

Owing to the great value of properly conducted practical work, I would urge that this side of our work be extended if additional time can possibly be obtained.

There is another change in regard to the teaching of a branch of zoology which has been in my mind for two or three years, and I am glad to find myself in agreement in regard to this with Professor Ewart and Professor Lorrain Smith. I suggest that a short course of parasitology in the third year would be advantageous. At present a certain amount of time is set aside in the third year for the study of parasites, the eggs of parasitic worms, etc., and my suggestion is that this work be remodelled on a broader basis. Parasitology has during recent years become so specialised that a pathologist or a bacteriologist can scarcely be expected to keep pace with its rapid advances; it is, in fact, medical zoology. For more than twenty years a course of medical zoology has been given by Professor Blanchard in the faculty of medicine in Paris during the third year, by which time the student can properly appreciate the importance of the factors in the life-history of the parasites and the effects on the human host. A similar arrangement in this university would prove beneficial, and I venture to put it forward for consideration.

(On being asked to deal definitely with the amount of time required for the suggested courses in zoology.)

I cannot say at the moment exactly how much time would be necessary for the proposed course of parasitology in the third year, but probably fifteen hours would go far towards dealing with the main points.

In regard to the first-year course I do not suggest any additional time for lectures. We can probably give the necessary instruction on the structure, development, and adaptations of animals in the present number of lecture hours, but the practical work should, if possible, be increased to half as much again, *i.e.* to seventy-five hours.

It has been suggested that the practical bearing of zoology on medicine should be pointed out to the student, but this is now so obvious that it is scarcely necessary to draw attention to it. Let me outline the first-year student's work on the invertebrates, with which I am specially concerned. Beginning with the protozoa in the lectures, I give an account of the structure, physiology, and life-cycle of amœba; I then describe entamœba, especially *entamœba histolytica*—the organism of amœbic dysentery—its chief characters and life-history, and how it is acquired by man. A free-living flagellate and a trypanosome and the part played by tsetse flies in the transmission of the latter are studied. Of the ciliate protozoa, paramæcium is selected for description. This organism has been investigated with extraordinary care; it has, for instance, been bred through more than five thousand generations by one observer, and we know intimately its life-history and its nuclear phenomena. Paramæcium is useful to the medical student, because it enables him to appreciate, by the study of a concrete example, several matters having a wide significance, *e.g.* the interchange of nuclei in conjugation, the subsequent reorganisation, and the influence of environment. The last group of protozoa—the sporozoa—is studied by means of two examples—(1) monocystis, parasitic in the earthworm, chosen because it is easy to obtain alive and on account of its large size ; and (2) the organisms of malaria, in regard to which the life-history and the part played by mosquitoes are made clear. The two-layered animals—hydra and its relatives—which are next considered, are useful as representing a stage in the evolution of higher animals and as a clear-cut example of the functions of the two cell-layers. Passing to a segmented worm, as an example of a three-layered animal, special attention is directed to the segmented mesoblast and to the occurrence of metameric segmentation in higher animals, up to man himself. The crayfish is used chiefly for the study of its external features, because of the striking manner in which this animal illustrates the adaptation and modification of homologous appendages in correlation with the discharge of various functions. The crayfish also affords a good example of the grouping of segments into regions and of "cephalisation." The nervous system provides an opportunity for discussing the evidences of the affinities of crustacea with segmented worms. A wide contrast from these is afforded by the snail, which is taken as an example of the mollusca. The general features of the groups to which these selected examples belong are given and reference is made to those members of the group which are well known or have any special relation to man. In addition, three lectures are devoted to parasitic worms, particular attention being given to their life-histories, their mode of entry into man, and to those means of prevention which are indicated by a knowledge of their biology.

In the practical course two segmented worms, a crayfish, and a snail are dissected ; the other selected examples are examined under the microscope, alive, as far as possible, in a series of demonstrations. If additional time can be given to practical zoology the whole course, but especially the microscopic work, will be remodelled as soon as conditions make this possible.

Dr. Rainy.—The position is a very clear one : the biological sciences of botany and zoology must, in a certain sense, be preliminary to medicine, and yet it has been put before us strongly that they should not be taken up at too early a stage of intellectual development. That, in fact, we cannot substitute school teaching for university teaching, and therefore if we are to retain these subjects in our curriculum we have to find an adequate place for them. We must gain longer time for the medical curriculum, even if it means an extra year. We are all strongly in favour of more practical work and of securing adequate time for such fundamental subjects as have been represented to-night. In that extra year we should also have to make provision for chemistry and physics.

Dr. Logan Turner.—One has always felt that the preliminary scientific subjects were an essential part of any university training in medicine. I cannot see the advantage that would come to the student by being taught these subjects in school. If the student were to start out on his medical curriculum with anatomy and physiology, he would attack these subjects with much less power than if he had already had some preliminary training in botany and zoology. In those classes he is taught to observe, and it is there that he learns a certain amount of independent thought.

Mr. Miles.—Now that we have heard the views expressed by the heads of the four scientific departments, I confess that I feel more than ever convinced that their subjects must remain part of the university teaching and not be relegated to the schools. The course of zoology has recently been spread over six months instead of three, and we are told that the students have done much better. If we could, without giving the professors of the early subjects any more hours, spread the existing hours over a longer perlod, I wonder if the students would carry away more than they do at present. Would the professors, by extending the period of study over, say, fifteen months, expect any better results?

How could we better co-ordinate zoology and botany with the earlier subjects in our curriculum? We have seen how we may, in certain departments of chemistry, co-operate with the professor in the later stages of the student's course. Could we in the same way secure from Professor Balfour some assistance as an introduction to bacteriology, or from Professor Cossar Ewart as an introduction to parasitology—say in the fourth or fifth year?

We cannot separate the question of examinations from that of teaching. We must find out how we can best test the student as he goes through his course, and not only at the end of it, and the appearance he makes during his course must count at the end as part of his pass marks.

Dr. J. S. Fraser asked the professors at what age they thought the medical student should begin his course. He was in favour of retaining the scientific subjects in the university curriculum.

Dr. Dingwall Fordyce. — It is important that these fundamental subjects should come at the beginning of the medical course, and we probably all agree that they are better taught after school has been left. In his last years at school a boy should not be starting the serious business of life; this should begin with the university. As regards a compulsory degree in either Science or Arts before the medical student starts his course, all who have been associated with universities where such a degree is compulsory must have recognised how different the students were in the later years of their medical curriculum; if the student has an accurate and thorough teaching in his fundamental subjects he will learn much more easily in the later years.

Professor Robinson.—As regards increasing the length of the curriculum from the parent's point of view, it costs, at the outside, to produce a medical student with a degree for the whole five years, about £900, including everything. It is about as good an investment as any father can make for his son, as he can get a living directly he is qualified.

It has been pointed out that in England they get a longer time for botany and zoology, but they take it off the final years.

Dr. Traquair.—I understand that the course of zoology is the same for students of Arts, Science, and Medicine. Is there any possibility, without deducting anything from the educational side of his studies in the preliminary sciences, of providing a selective course specially adapted to the student who is ultimately going to become a medical practitioner, giving special attention, for example, to such subjects as parasitology, at the expense of the kind of course that a Science or Arts student would be taking?

Mr. John Fraser.—We ought to look at this subject more from the point of view of the student, because, after all, it is the student whom this matter is going to affect. In these preliminary subjects it should be made clear to him why he is being taught zoology and botany from the point of view of his after-studies. Many students are antagonistic to botany and zoology when they begin because they do not understand why they are being taught.

Dr. James Miller.—The medical student first wakes up when he comes in contact with the patient. A medical student cannot too early come in contact with the surgical out-patients. Looking back to the time of Mr. Joseph Bell and Mr. John Duncan, one remembers that when they were taking their out-patients they aroused in the students an interest in the practical clinical side of surgery that never died. Professor Bayley Balfour said that he would like his students to know something of chemistry and physics when they came to him. Is that not an argument that the boy at school should have some teaching in physics and chemistry—that he should know what every educated man ought to know—something about heat and light, and something about the general broad outlines of Nature?

Professor Lorrain Smith.—The subject has been dealt with practically on the conception which Professor Bayley Balfour introduced, *i.e.* that you are changing the whole mental outlook and attitude of a boy who comes from school to the university, and that he is passing from study under authority to the study of evidence. We are attempting to define what we are aiming at with the student when we get him into the new sphere; some little preliminary acquaintance with the general principles of chemistry and physics may be good, but this should be very simple—the kind of science which lends itself to school teaching. If you pass on a little you get into a sphere which it would be very difficult for the schools to qualify themselves to occupy. We are now setting out to study more clearly what I may call the psychological position of the student when he comes to the university. What should be his first subject of study? After what Professor Cossar Ewart, Professor Bayley Balfour, and Dr. Ashworth have told us it would be difficult to imagine anything better than the study of organic life, by the methods described, as an introduction to the study of medicine. The living organism in its evolution is in itself one of the most fascinating problems which the human mind can take up, and I think if we fail to interest our students in this they must be, mentally speaking, extremely pachydermatous.

It has been suggested that instead of five years the student may have to spend six years over his course. We in Edinburgh have kept the fifth year entirely free from systematic teaching. In some other schools they have not succeeded in doing that. I think that we will find that after five years a man begins to get stale as a student. We are sometimes disappointed in the men who have taken an Arts or Science degree preliminary to medicine. I think the reason is that they want a change of pasture from being undergraduates; if we keep the man too long in the same method of study, going to lectures and being taught to observe, he gets tired, and it would be much better if he could then pass to post-graduate methods. Is it therefore wise in the interests of the student to extend the course further than five years?

The contribution to-night has taken us forward a very definite step in dealing with the curriculum, and will be very helpful in the discussion of the further subjects. The attitude of the student at present is radically unsound. He wants to get away from the teacher and commit to memory the maximum of printed matter. He thinks the more he can commit to memory the better it will pay in the examinations. I was hoping that Dr. Ashworth would develop his scheme of practical work to the point that he would be able to abolish the examination. So far as he abolishes lectures he is going in that direction. Could he not arrange the practical work so that examinations would become a superfluity? They have gone a considerable distance in that direction in the Arts Faculty. In certain subjects term work counts in the degree examinations. We have the General Medical Council watching over us, and no doubt there will be great difficulties put in the way of abolishing examinations, but I think it may be managed when we can show properly organised courses of study and proper methods of carrying them out. Thus I hope we shall study the psychology of the student, and try to get rid of this nightmare of examinations.

Professor Bayley Balfour said in reply.—I thoroughly agree with what Professor Lorrain Smith has said about the examinations. I confess I have tried to do without them in my course as much as possible. I tell the men at the beginning of their practical work that I shall watch them individually throughout the session, and if they do their work thoroughly well they need have practically no fear when they come to the examination room. I find this gives most excellent results. I should have very little to complain about in their work if it were not for anatomy in the afternoon!

I find that the men who have taken their M.A. beforehand are much more easily taught; they get a grip of the subject much better than the young men. Boys who come up at seventeen are far too young. I find them at eighteen or nineteen much better. I am delighted to find that there is such general sympathy with the foundation sciences in the club to-night. In a way it comes as a surprise, because not so very long ago the talk of medical education was always in the direction of abolishing the biological sciences from the curriculum.

As to co-ordination of the subjects, I think that, so far as my subject is concerned, it must come through these equipment subjects. I can only indicate the elementary work so far, and the special forms in which my subject touches upon medicine should be dealt with by the special lecturers in the later periods of the men's course.

Professor Cossar Ewart said in reply.—It has been asked whether it would be an advantage to delay the examination in zoology for a number of months after attending the course. The written examination might be delayed, but it certainly would not be an advantage to delay the practical part of the examination. If a student has been dissecting for three or more months it is only fair to give him an opportunity of taking his practical examination at the end of the course. His work during the term ought, as a rule, to show whether he should get through or not; a good record should count for something in the professional examination.

With regard to asking for more hours, it is only fair to the men. If a man, *e.g.*, makes a dissection of the nervous system of the skate, but has no time to make drawings, he will often profit little. To dissect without making drawings is often a waste of time.

In fixing five years for the curriculum we are only fixing a minimum. One year of the allotted time might be regarded as not for medicine at all. To hurry a man on, as Lister said, is not economic.

V.—THE TEACHING OF ANATOMY.

By Professor G. ELLIOT SMITH, Manchester.

In every field of human activity there is a tendency, once a procedure has been devised that gives satisfactory results under the conditions then prevailing, for the methods to become stereotyped and handed on by tradition to other times and generations of students, the respective conditions and needs of which are not the same. If we are to guard against this insidious influence, which in every field of endeavour is fruitful of waste and misdirection of energy, we must from time to time take stock of our methods and ask ourselves whether they are really those best adapted to meet the needs of the ever-changing circumstances.

In so venerable a subject as anatomy there has been ample time for the hampering influences of tradition to develop; and the danger from them is much more serious than in the case of many of the newer subjects of the medical curriculum, which have been immune from the risks of such conventionalisation as is inseparable from old age. Anatomy has not responded—perhaps, it will be claimed, solely because there has been no need for it to respond—so rapidly and completely as, say, such a mushroom growth as pathology, in adaptation to the altering needs of the time.

Two main criticisms of a general nature must be brought against the teaching of anatomy in most British schools. First, there is the extreme narrowness of the conception that all the anatomist has to teach his students is the dissection of the dead body, and by means of a prolonged series of lectures to reiterate the same mass of information in another way, perhaps with a few tags of embryology. Secondly, there is the method by which such teaching is conveyed to him—the dreary systematic lectures, the absence of any real attempt to explain the meaning of the structure of the body, its physiological significance, and its relation to the problems of the pathologist and the clinician.

Anatomy should be regarded as an integral and intimately co-ordinated part of the whole medical course, and it should be the business of the teacher to give expression to this broad view in his teaching. How, for example, is it possible to convey to the student any intelligible account of the central nervous system without discussing the meaning and the functions of the various arrangements of neurones and describing what happens when injury or disease interferes with their connections? What a hopeless and incomprehensible maze the cerebellum, the sensory tracts, and the connections of the red nucleus are when stripped of these functional explanations. But if they are discussed with the help of physiological and clinical data they become simple, intelligible, interesting and arresting, and hence easily remembered. In every department of anatomy the same method can be used with advantage. By so doing, the teacher is not merely giving the student a broader and more practical knowledge, but he is conveying to him the kind of information which appeals to his interest and can be remembered because it has some meaning. No longer is it a case of learning by rote his way through a confused labyrinth of meaningless facts, but it becomes an appeal to his intelligence to realise their meaning, and so, by comprehending their purpose, the student has a reason for remembering.

In a discussion of the teaching of anatomy it is essential that we keep our aim constantly in view—it is to convey to the student within a strictly limited period of time an intimate acquaintance with the structure and meaning of the *living* human body. Though most of the student's knowledge is acquired by the dissection of the corpses of more or less senile wrecks of humanity, it should not be forgotten that his primary aim is to learn the geography of the living bodies of men and women. It is vitally important that at every stage of his investigation of the corpse he should be forced to picture to himself, and, so far as possible, to study on the living body—by the examination of the surface anatomy of living models, by the use of X-rays, or by the study of results of disease—what significance the facts have in the active living body. The student of anatomy is learning the geography of the territory in which all his work as a practitioner will be conducted, but he must never be allowed to forget for one moment that his aim is to understand the living body and not merely a corpse.

Though the time spent by the student in the dissecting-room is now cut down to the irreducible minimum, it is still sufficient to enable him to examine in detail every part of the body. In spite of anything that may be urged against this course, it is vitally important that nothing should be allowed to stand in the way of this essential training of eye and touch to become thoroughly familiar with the arrangement of every part of the body. Whether the student remembers all the names or can write an account of all that he has seen or handled is of secondary importance. The primary value of dissection to the student is to enable him to find his way about the body. Much of the knowledge he acquires is of a subconscious nature, but is none the less real on that account. By a limited experience I have learned to find my way from Princes Street to the University, but I cannot name a single street or landmark, nor give more than the vaguest description of the route; yet I have the essential knowledge which meets my needs. The vital knowledge of anatomy that it is essential for the student to acquire is of a similar nature. Those practitioners who boast of their lack of anatomical knowledge, simply because they cannot name many of the landmarks which guide them, forget that the information they rely upon was equally (with the terms they have forgotten) acquired in the course of dissection, and is the sort of knowledge with which the study of anatomy should primarily aim at supplying the student. But the teaching of anatomy should aim not merely at familiarising the student with the geography of the body; it also should enable him to learn to appreciate the meaning of its structure, to understand the factors which regulate its growth and development, which determine its form and explain its anomalies —in a word, the student should be made to understand the living organism with whose working all his professional work is concerned.

In all studies the greatest incentive to the acquisition of knowledge is interest. The student of anatomy in practically every instance is looking forward to the profession of medicine. In commencing the study of anatomy he is getting the first glimpse of the promised land. He feels that he is really beginning professional work when he takes the scalpel in hand and begins to explore the human body. How is this enthusiasm to be cultivated and encouraged? Is it wise to kill this plant of tender growth by the daily drudgery of lectures on bones, extending over weeks and months, until the mere sight of a bone is sufficient to excite the suppression of all interest in it? The student who knows nothing of medicine or surgery is yet keenly interested in all that pertains to the work of his profession. The use of facts of clinical medicine and surgery, of pathology and physiology, to illuminate the significance of anatomical data is an invaluable adhesive. By appealing to his interest by such demonstrations, anatomical information and its meaning can be impressed upon his memory.

It must not be supposed that I am claiming to make the anatomy lecture-room the place of instruction in physiology, pathology, medicine, and surgery. All that I am asking is that the various branches of medical study should not be regarded as strict preserves, enclosed in water-tight compartments; and that it should be the duty of the teacher of anatomy to have recourse to every kind of device which will help to impress upon his students' minds the facts of anatomy and their meaning, irrespective of whether they belong to his own province, or those of the zoologist, the embryologist, the histologist, the physiologist, the pathologist, or the clinician.

If the exhibition of a patient with compensatory distension of the superficial veins of the abdomen will impress upon the mind of the student the anatomy of the portal anastomoses, the anatomist ought not to hesitate to use such a patient for this purpose—not to pretend to teach medicine, but to interest the student and so impress anatomical facts upon his mind.

Lectures on Anatomy.—A fortnight ago anatomy suffered a grievous loss by the death, in the prime of his powers and influence, of Franklin Mall, who revolutionised the teaching of anatomy in America, and was in larger measure than anyone else the inspiration of the marvellous progress of anatomical research there. One of his reforms was the practical abolition of lectures as a means of teaching anatomy. Is this an example to follow? I agree with Mall to this extent, that, taking into consideration the limited amount of time of the student and the excellence of the text-books now at his disposal, the attempt to deliver a systematic course of lectures is wholly indefensible; it is a waste of precious time which can be more usefully employed in other ways. But I refuse to admit that lectures do not serve a very useful, if not invaluable, means of instruction.

Instead, however, of employing the time in expounding to the student information which he can more usefully acquire in the dissecting-room or in the study of his text-book, the teacher should make it his business in the lectures to deal with aspects of anatomy which the student is unable adequately to learn in the ordinary work of the dissecting-room, such, for example, as the lymphatic system, certain parts of the nervous system—for instance, the clinically important but much neglected sympathetic system—and the anatomy of the viscera.

Lectures should be devoted also to the business of linking up the knowledge of the structure of the body and its meaning, which is acquired practically in scattered fragments, and in emphasising points of outstanding importance and so giving the student a right perspective.

In this country there is far too much spoon-feeding. The student should be required to find things by his own unaided efforts—to be allowed to get into difficulties and find his way out. This teaches him observation and impresses the essential facts of anatomy on his mind in a way which does not occur when he constantly has a demonstrator at his elbow to save him any mental exertion.

But in saying this I do not mean to imply that our anatomy departments are overstaffed. We need much larger staffs than we command at present, but they should consist of men or women who are really working at anatomy and are competent to provide the student with first-hand information and to train him to observe.

It is important that demonstrators should have ample leisure in which to carry on serious research. No man can be a really efficient and stimulating teacher unless his own mind is kept constantly alert by original investigation. Unless this is so he is merely a purveyor of second-hand goods. He may, no doubt, be very efficient in cramming men for examinations; but if he himself is not interested in the acquirement of first-hand knowledge, he must, of necessity, fail to stimulate in others the interest which is the essential incentive to real observation, and is at the root of all real training.

The man who is actually engaged in research, and can give the student first-hand information, can also describe from his own experience the difficulties that have to be overcome and the way progress is actually achieved. The investigator, who can, by his example, demonstrate to the student that real learning can be acquired only by individual effort and research, has at his disposal the most powerful instrument, not merely of stimulating students to acquire true, and not second-hand, knowledge, but also of firing them with the zeal to learn from their own observations and to trust their own judgment. This is the secret of all real success in the practice of medicine. Clinical work is, in the truest sense of the term, original research, and the anatomy rooms are the place where confidence in his powers of observation and reliance in his own judgment should be instilled into the student's mind.

These views may be trite and threadbare, but, in spite of age-long lip-service to them, they are still sadly neglected. The text-books of anatomy would not be so full of traditional errors if students and teachers could be taught to trust their eyes. The discipline of anatomy should thus teach students to rely on their own judgment. But it can achieve this important aim only if the student's attention is kept constantly alert and his interest excited by considering the why and the wherefore of everything he sees and feels in the course of his practical work.

OSTEOLOGY.—In former times, when the supply of material for dissection was even more precarious than it is now, the study of anatomy came to be based essentially on the examination of the skeleton. The student was lectured *ad nauseam* on bones; he was encouraged to devote himself to acquiring an intimate knowledge of this framework of the body, upon which he could subsequently hang such tit-bits of information concerning the soft parts as he was able to pick up later. The phrase "dry bones" became a byword for dulness and lifelessness, and all that was dreary in the way of acquiring knowledge. It became the highest encomium upon a teacher's abilities that "he was able to make the dry bones live." This wicked and sterilising farce is still enacted in many schools. The antiquated tradition of the osteology class is still permitted to waste the student's time and kill his natural interest in the subject of anatomy.

The bones are as much a part of the body as the muscles, the blood-vessels, and the nerves, and they ought to be studied in the same way, *i.e.* in the dissecting-room. There the factors that determine the form and the markings of bones should be studied by direct observation, instead of being learned by rote from the statements of a text-book or a lecturer. If the student is required to study the skeleton in this way he will not only acquire a sounder and a truer knowledge of it, and in a much less tedious way, but he will get the sort of information that is practically serviceable. Moreover, he will learn by observation and acquire knowledge which is much less evanescent than the artificial collection of data crammed from books.

In the introductory course of lectures the student should be taught the nature and the mode of development of bones, the kind of knowledge he will have to acquire, and how this can be accomplished in the course of his dissections. When this has been impressed upon him and care taken to insist that he really studies the skeleton in the course of his dissection, the student, freed from the depressing tedium of the osteology class and convinced of the futility of burning the midnight oil over dry bones apart from the body, will acquire a much more proficient knowledge of osteology than the antiquated method gives him.

Such a method will also give him a better perspective in the study of individual parts of the skeleton. Why, for example, should it be a practice artificially to wrench asunder the constituent bones of the skull, to multiply difficulties for the student, to make him learn hosts of useless details, and distract his attention from the articulated skull with which he really has to deal in practical surgery and medicine?

Looking back to my own student days, when, full of enthusiasm for the subject, I first began anatomy and sat at the feet of one of the most clear-sighted and inspiring teachers, I have the most vivid recollection of the manner in which those first two terms of osteology rapidly killed all interest in the subject. It was not merely that I ceased to learn anything from the lectures, but a positive and intense repugnance to the business of acquiring a knowledge of the bones took possession of me.

In the light of this experience, when I took over the control of a department of anatomy, I gradually eliminated the osteology course, to the mutual advantage both of the students and teacher.

Course of Instruction.—Now let me attempt to sketch out a scheme for allotting the limited amount of time the student is allowed for anatomy.

During his first term the student should be required to dissect a limb, preferably the arm; he should be compelled to do the work thoroughly, to learn his technique, and to use and care for his instruments. It is of the utmost importance that from the outset he should be trained to correlate all the facts which he learns from dissection with such knowledge as he can acquire from the study of the living arm, both upon himself and a model. He should familiarise himself with every detail of the surface anatomy of the living limb, and the changes produced by the action of muscles. This should be a matter of constant study at every stage of the dissection, and not be relegated to some other time when the whole dissection is completed. It should be his business closely to correlate and integrate all kinds of knowledge of bones, muscles, vessels, etc., with that relating to the form of the living limb, and this can be done efficiently only when the student is actually examining the structures which are to be correlated with the surface anatomy. Facilities should also be given him at the same time to learn from X-ray photographs and also how to interpret them.

In the introductory course, which in Manchester consists of thirty lectures, I attempt to give the student a general survey of the scope and methods of anatomy, an account of the outstanding features in the developmental history of the human body, and the factors which regulate its growth and determine its form and size. In this course a general view of the structure of the human body is presented to the student, with an account of the metabolic factors involved in the assumption of the secondary sexual characters, the phenomena of heredity, the variability of structure and its significance.

After each lecture the student devotes two hours to the practical study of the histology of the structures dealt with in the lectures, such as the sexual glands, Graafian follicles and corpora lutea, the uterus and Fallopian tubes, the placenta; and a detailed examination day by day of the sections of a third-month human embryo, which familiarises the student with the general anatomy of the whole body, and gives what is really a diagrammatic idea of the histology of the organs and tissues.

The value of such an introductory course is difficult to over-estimate. The student not only gets a wide view of the whole subject and its problems and the method of study, but even the dullest in the class is stimulated to take an interest in anatomy and to learn to be observant.

If this first term's work has been consistently carried out, the student is fairly launched on his course, fully equipped to carry on his practical work without much help, and keenly alert to understand the meaning of the structures he is dissecting.

It is necessary for the teacher constantly to impress upon him the importance of the surface anatomy of the living body and of the study of the functions of the arrangements of parts. The lecture courses in the next four terms deal with the lymphatic and nervous systems, the pelvis, and the abdominal and thoracic viscera; they are intended to supplement the studies in the dissecting-room and to co-ordinate the information so acquired with that provided in the embryological and histological classes. I hope very soon to be able to start practical courses of instruction in the histology of the organs of the *human* body, for in teaching anatomy it is essential that the structure of the body should be studied as completely and as practically as possible.

The student should be provided in the anatomy department with such information and training as will enable him to proceed directly to the task of studying morbid anatomy and histology in the department of pathology. At present this is not the case. Not only is the borderline between macroscopic and microscopic anatomy almost wholly neglected, but also the histology, especially of *human* tissues and organs. It is essential that the student should be thoroughly trained in these matters, and this can be brought about only when the anatomists assume control of the teaching of the whole anatomy of the body, whether this is seen with the naked eye, through a lens, or a microscope.

ANATOMY AS THE FOUNDATION OF MEDICAL EDUCATION.—One of the most important functions of teaching is not merely to give the student a clear insight into the intrinsic merits of the subject, but also—and this is of fundamental importance in any course of professional instruction—to prepare him for those special applications of the subject, in physiology and pathology, in surgery and medicine. The teaching, in other words, should be directed towards the needs of the practice of medicine; and it should be the business of the teacher of anatomy to keep sufficiently in touch with the progress of medicine as a whole to direct his teaching toward the right aim.

The development of abdominal surgery, for example, called for a more or less complete reorientation of the anatomists' teaching. So in every branch the anatomist should keep in view the special needs of the practitioner and emphasise those kinds of knowledge which have direct practical importance.

If anatomy is thus taught as an integral and vital part of the medical curriculum, closely co-ordinated with the rest of the course, the student will acquire the habit of returning to the dissecting-room from time to time throughout the rest of his course to seek the solid foundation of fact when in difficulty. Thus anatomy will become once more the real basis of medical education.

The practice of requiring fifth-year students to attend a course of clinical anatomy, given by an anatomist in the department of anatomy, has played an important part in the development of this co-ordination between anatomy and medicine. This system has now been in practice in Manchester for eight years, and it is a step towards the more intimate integration of anatomy with every part of the medical course. Incidentally it helps us in the anatomy department to keep in closer association with the clinical point of view.

The student of medicine must be taught to think anatomically; and this can happen only if from the day he begins the study of anatomy he is constantly impressed with the idea that he has to deal with the living body, and that lines of demarcation between anatomy and physiology, pathology, and clinical work are merely arbitrary and not barriers against a free exchange of ideas.

VI.—THE TEACHING OF ANATOMY.

By DAVID WATERSTON, M.D., F.R.C.S.E., Bute Professor of Anatomy, St. Andrews University.

I UNDERSTAND from the secretary that my part in this conference is to give you the views which I hold upon improvements that may be effected in the teaching of anatomy in the medical curriculum, as a part of a general scheme for the improvement of medical education. I willingly raise my voice for such an object, for the present conditions are in many respects unsatisfactory. They bear with special weight upon the anatomical teacher, who often feels how impossible it is for him adequately to carry out his share in the medical curriculum from the inadequate time afforded to him, as well as for other reasons.

Probably I need hardly devote any time to proving to you how difficult it is to carry out our work satisfactorily under the present conditions, but I am firmly convinced that it is as a direct result of insufficient anatomy that the education of the medical student in other subjects of the medical curriculum so often fails.

Before we can draw up a plan for our guidance, it is essential that we have a clear idea of the position of anatomy in the curriculum, of its relation to the other subjects, and of the aims of the teacher of anatomy in planning his courses.

I am not quite sure that an audience such as I am addressing, composed largely of specialists, is the one best fitted to judge of the relation of anatomy to the work of the general practitioner, and of what should be our aims in training students who, for the very great part, will be general practitioners, but yet I feel that you must be sympathetic to the subject; for the first step in your own specialisation probably began with, and certainly has included, an independent, fresh, and complete study of the detailed structure of the organs or region of the body in which you are specially interested, whether it be the eye, the ear, nose and throat, gynecology, mental diseases, or even dermatology. And I expect that most of you have not found it sufficient to study the structure of the adult organs only, but you have found that in order to understand the anatomy and pathology of the fully formed organ it was necessary to look minutely into the successive stages of its development. And conversely, I am sure that the examination of large numbers of cases of diseases of the region has often thrown new and valuable light upon problems of structure which were formerly unnoticed or obscure. Now, if such a training is the first step in the education of the specialist, it embodies in miniature something of what we require for the general practitioner. And the general practitioner is even more dependent than the specialist upon a knowledge of anatomy, insomuch as his diagnosis so frequently rests upon information obtained from an examination of the patient by touch and by inspection only, and apart from the special aids which the laboratory and the consulting-room can afford.

The very basis of the ordinary physical examination by a practitioner rests primarily upon his familiarity with the normal anatomy of the human body. I am in entire accordance with the views of an eminent surgeon in Edinburgh, whose name would carry very great weight with you, who has told me that his experience has been that he sees more cases of errors in diagnosis and in treatment which have arisen from defective knowledge of anatomy than from any other cause.

My recent experiences of service as resident surgeon or as surgeon, with the accompanying contact with young graduates, not only of our own school but of all the Scottish universities in the intimate relationship of colleagues in the same war hospitals, opened my eyes to the handicap, with which so many of them were contending, of an imperfect and inadequate knowledge of the structure of the human body, a handicap which they were the first to realise and to acknowledge, and which they were for the most part keenly anxious to overcome.

But while a comprehensive minute knowledge of anatomy is of the greatest value in practical work, such a knowledge is not generally attainable, for the detailed study of the structure and development of the human body is not a study only of months or of years, it can last a life-time, and the problem before us is to make the best use of the limited time at our disposal.

The fundamental aim of the anatomist is the investigation of the structure of the body as a whole and of its parts in relation to the activities which they individually and collectively exhibit at all periods of the cycle of development and in response to the external forces which act upon them.

It has been pointed out that in the medical curriculum anatomy occupies a central position, its scope overlaps physiology, pathology, zoology, and psychology, and we cannot separate anatomy from any of these by any arbitrary line. Its scope, however, is limited from the fact that these subjects, mainly originating in anatomy, have now become separate and independent subjects, but their very roots still draw nourishment from the fruitful field of human anatomy.

Close association with the purely technical aspects of medicine and of surgery have also tended to narrow the scope of the subject in so far as they have tended to look upon anatomy merely as an aid to established procedure.

The purely morphological conception of anatomy as illustrated in our text-books retains little of the former animating idea of function, which alone can impart to the subject a vital interest. Certain little scraps still remain as vestiges of the former wider outlook of anatomy, such for example, as the chemical analysis of the composition of bone tissue, which is still found in current text-books, and is the only scrap of chemical analysis retained.

From the functional standpoint, anatomy has been robbed of almost every portion of its heritage except, perhaps, the grosser mechanical action of the muscles, the function of the valves of the heart, of the functional distinction between the roots of the spinal nerves, and the function of the motor areas of the cerebral cortex.

Within recent years, however, there has been a reaction against this condition of affairs, and against the view which would make anatomy merely a morphological study of the dead body.

The study of the living model, and the general use of X-rays to illustrate structure as found in the living, form two examples of this newer attitude, and anatomical work on the structure of the heart from the standpoint of function has been applied so as to revolutionise our conceptions of the physiology and pathology of that organ. The stirrings of this newer spirit will, I am sure, soon make their influence felt in bringing about many alterations in our attitude to the phenomena of disease.

The practical task of the anatomist in dealing with his students is, in the first place, to imbue them with the spirit of investigation of structure in relation to function, and, in the second place, to ensure that, as they pass through his hands, the students acquire a competent knowledge of the structure of the body. In both of these directions his task is a long and arduous one. The raw material upon which he has to work consists of a mixed mass of men and women, the majority of whom are indifferently educated, with wide variations in their intellectual capacities and ideals, and knowing nothing of the structure of their own bodies. Anatomy forms, in the majority of cases, the gateway through which a flood of new ideas comes in.

At present in the Scottish universities the curriculum in anatomy nominally extends over two years, though the student's attention in the first year is so much taken up with the preliminary scientific subjects that it is of little value to the anatomist. During that time attendance is required upon a course of systematic lectures, given by the head of the department, which forms an introduction to the subject.

In the second year only optional courses of instruction are provided, but attendance upon courses dealing with topographical anatomy is general. During the two years dissection is carried on. Later in the course, in some schools, an optional course of anatomy in its relation to surgery and medicine is given, and the course of "operative surgery" constitutes a useful review of anatomy of portions, at least, of the whole body,

It is, in some respects, unfortunate that the course in anatomy has to precede hospital work; when in contact with the problems of injuries and diseases the student comes to appreciate the value of a thorough knowledge of structure as an equipment for dealing with these problems, and the stimulus and interest so created come too late to be of any use to the anatomist. But yet most students have no lack of interest in the subject, and the essential preliminary work in anatomy fully occupies the time available at this stage.

The terms alone used in anatomy are so numerous as to form a new vocabulary, which cannot be acquired in a short time. In the first year there appears to me to be room for great improvement. During it, at present, the student's education is being carried on in subjects which properly are introductory to anatomy and should not run concurrently with it, and anatomy cannot be, and is not, satisfactorily studied until this preliminary work in zoology, physics, and elementary chemistry has been completed. Botany should, I think, be transferred from the medical curriculum to the preliminary examination, for it is a subject which can be taught in schools to the stage that is necessary for medical students with great advantage.

I would suggest that after the completion of the preliminary scientific courses two years should be given to anatomy and for part of that time to physiology and pharmacology, and the student should also continue his work in chemistry.

As practical means of education we have the combination of the methods of "lecture-demonstrations" and practical laboratory work. From my own experience I am convinced of the value of well-illustrated lecture-demonstrations, and we cannot dispense with them. I am sure also that the custom of a daily lecture during the whole term is a mistake and is too frequent, both for the student and the teacher. Such lecture-demonstrations consist of two main groups, first of a series which are introductory to the practical study of the subject, in which the general structure of the body is illustrated and the structure and the function of the various tissues and systems are explained.

In my own course I find it is useful to deal with the subject of osteology, not as a mere description of the dried bones, but to explain fully the differences which exist between a dried and macerated bone on the one hand, and a living bone as it exists within the body at different stages. This raises at once problems of embryology, of the mechanism of growth, of internally secreting glands, of experimental methods for approaching the solution of problems of structure, and so forth. Then the limb skeleton, including the ligaments and joints, are briefly described from the standpoint of an examination of the physics and dynamics of a physical mechanism. Later on, the functional structure of some of the simpler systems is studied. X-rays and lantern and microscopic projection form an indispensable assistance in a course of this kind. To the individual teacher may safely be left the arrangement of a course on the lines I have indicated, and I do not consider it necessary to go into fuller details.

In a later part of the course the students gain great assistance from a course of topographical anatomy, in which the actual dissections are for the greater part done in front of the class by the lecturer. Such a course follows the student's own dissection of the region dealt with, and in no sense replaces his own practical work.

The lines on which the student's practical laboratory work is to be carried out require the most careful attention, and no unnecessary difficulties, such as overcrowding, bad lighting, or ventilation should be allowed to exist. Anatomical laboratories have in the past been starved in personnel and in equipment. Dissection is an introduction to surgical practical work, and it should be used to train the student in habits of neatness, cleanliness, and order.

I have not referred to the part which embryology and anthropology should take in the student's training in anatomy. In them are represented the principal lines along which anatomy, as a science, is advancing. Embryology is particularly important as a branch of the medical curriculum, not only from the help which it gives in explaining rationally the details of adult anatomy, but also from the conception it provides of the human body as, in each individual, a developing and changing organism. These two subjects form a part of the necessary "science" equipment of a department of anatomy, and will probably come to have an even larger bearing than at present on the problems of practical medicine.

Nor have I discussed the question of the teaching of practical histology in the department of anatomy. No arbitrary line can be drawn in terms of the visual enlargement employed in the study of structure, and the microscope is essentially an instrument of the anatomist. His teaching cannot but deal with minute structure, and it would seem to be only logical that he should give the whole teaching required in that subject.

I am quite sure that a medical school does not obtain the full benefit from its department of anatomy unless that department can be made use of to a much greater extent than merely up to the end of the second or third year of the student's education. Its bearing upon the clinical studies arises fully only in the later years of the curriculum, and means should be provided for bringing the students and teachers of these subjects into contact with the department of anatomy by the provision of special lecture-demonstrations on applied aspects of anatomy during the later years. Courses on such subjects as the anatomy of the central nervous system and organs of special sense, as well as applied surgical and medical anatomy, should be given within the anatomy department by some of the younger specialists on these subjects, as an introduction to the clinical special courses.

Lastly, I would venture to urge very strongly a modification of the present system of professional examinations, with a view to substituting for them in their present form a consideration of the record of a student's work during his whole course. Such a record forms a better ground for judging of his knowledge of the subject than the present test. This, however, is rather apart from the main subject of this paper, and I would only say that I am sure that a change of this kind would react most favourably upon the standard of work which is attained at present.

VII.—THE PLACE OF ANATOMY IN THE MEDICAL CURRICULUM.

By Professor ROBINSON.

Anatomy as an independent practical science and as a fundamental science requires for its proper pursuit an adequate amount of time and an adequate provision of facilities. To my mind, training in anatomy should not cease when a man leaves the anatomy rooms and goes to the hospital; the necessity should be laid upon him of undertaking additional work in anatomy following the lines of the special work he is doing in the hospital. Perhaps it would clear the ground if I told you in the first place what we in the anatomy department try to do, and, in the second place, what we would like to have done.

You must understand clearly that what I am going to say about what we do does not necessarily apply to this year or to the years of the war, because, owing to lack of staff, we cannot follow the course we pursued before the war. You all know how much time is allowed to us. A student commences anatomy as soon as he enters the university, and by the end of his second year, therefore, it has been possible for him to have six terms at the subject—perhaps even seven, according to the time he enters. The regulations are that he shall attend one course of lectures and have five terms of practical work. I shall deal with the lectures first.

The *lectures* are given in the first winter, when the man knows nothing about anatomy. I cannot give you a syllabus of them, because they are never the same in any two years, although they follow a general plan, the aim being to show generally what man's place in Nature is. Later we point out to the student that man is an organism, and that the organs he possesses are arranged in definite systems, and we tell him what the purposes of these systems are. Afterwards we go on to show the topographic relations of each system with every other. When this ground has been covered—or sometimes before—the student gets a general sketch of human development, up to the formation of layers and the further elaboration of layers into tissues. Then, if there is time, he gets a fairly full account of something he cannot follow very well in the dissecting-room in one system, say, the central nervous system. Its relations to medicine and surgery are pointed out. I find that to go over the work I have specified takes all the time at my disposal—indeed it never gets fully accomplished.

There are no tutorial classes in association with the lectures now.

With regard to *practical anatomy*. The student, as I said, has five terms of it, and in that time he has to dissect the body—one part in each term. A good student might possibly be able to do more than that in connection with certain parts, but if he could, we could not give him the material, unless we were to poach upon that ready for next term's work. Thus in five terms he takes the body to pieces more or less satisfactorily *once*. After that he has a term—provided that he has not been thrown back by bad work—in which he can work as he likes and revise his knowledge in order to bring it up to the point necessary for examination. In addition to the practical work, and in association with it, there is for junior students a series of tutorial classes on bones. This tutorial instruction refers to the practical work only, not to the lectures at all. For second-year students there is a series of demonstrations, which are not, however, compulsory, and in association with this subsidiary tutorial classes are arranged, so that a man can, if he likes, in his last term revise quickly, at any rate, the essential parts of the body.

His knowledge, as gained from the lectures, practical classes, and demonstrations, is tested in a series of examinations—in the first place in the dissecting-room. When we have our proper staff, students are divided up into groups of not more than thirty if possible. Each group is under one demonstrator, who is responsible for supervising individually his group during its hours of compulsory practical work, viz. six hours a week for the first summer, and for the rest of the time ten hours a week, plus as much more as possible. The demonstrator has to give a report of each student, with his opinion as to the man's capabilities and whether he does his work satisfactorily. This report is again supervised, and finally entered into our book, where we keep a record of the whole work of each student from the time he comes to us to the time he leaves.

The student has three examinations in connection with the lectures —none of them very difficult—which help him to focus what he has learned in the two lecture terms. In connection with his practical work he has to pass first of all three examinations, on each part he dissects, under different demonstrators, with a final examination on the whole. If these show unsatisfactory work, he is sent back to revise. Thus he gets during his five terms twenty examinations on his parts. He has in addition, on his demonstrations, which he takes in two terms, four examinations, each of which consists of three parts—a written, a *vivâ voce*—always on surface anatomy—and an examination upon the parts which have been dissected—good parts, carefully dissected, and in which the organs are easy to recognise if the student knows his work. As a result of all these examinations, we can tell quite readily who should pass and who should not in the professional, and I may say that on this basis there would be a far larger number of rejections than actually occurs. A good many get through—and rightly too—owing to the fact that after leaving the regular class instruction they have a term before going up for the professional examination in which they can focus their knowledge and successfully pull up their work to satisfy the external examiner.

In non-war times, in association with the lectures, there are displayed in the dissecting-room micro-photographs of tissues and of various stages of development, together with explanatory charts, and skiagraphs of various bones are put up in the dissecting-room window, and are left there for a long period of time.

The work runs through two years, and we see nothing of the men after that, with the exception of those who come to act as assistant-demonstrators. When they leave us they seem to forget all their anatomy. I do not know if it is touched upon in the clinical work; at all events it cannot be touched upon in any way that focusses their attention, because towards the end of the fifth year, when they come to us again, they know practically nothing of what they were taught before. This is the experience of many other schools also.

What I would like to see is some more dissecting. A man must take the body to pieces more than once if he is to have a satisfactory knowledge of it. I would like to see anatomy carried on through all the remaining terms of the course; there should be a constant possibility for every student to obtain instruction in anatomy associated with the work he is doing at any given time in the medical or surgical departments. There should be constant classes of applied medical and surgical anatomy to revise certain essentials. This could easily be arranged if we had a proper staff and a little extra time. I would also like to see in the department a further expansion of X-ray work. Not only should skiagrams be put up so that a man can see the difference between the portions of the body in an X-ray photograph and the appearances as he dissects them, but he should also have his attention drawn to the points which are of an importance which it is difficult at times for him to estimate properly. For more than eight years there has been, in the fifth year, an invaluable, but nevertheless a purely clinical, class of applied anatomy conducted by Mr. Stiles. It has, unfortunately, had to be stopped this year, but it would, of course, be expanded under the system I am suggesting.

DISCUSSION.

DR. LOGAN TURNER.—I conduct my practical classes wholly by question and answer, and have been struck with the inability of the student to answer simple anatomical questions. The specialist cannot expect the anatomist to teach all the minutiæ of the anatomy of his particular subject and their application to the function or to the pathology of the region, but there are certain broad anatomical questions, *e.g.* the difference in the course of the two recurrent laryngeal nerves, or the arrangement of the lymphatics in the neck, that one would expect to be answered by most students; but they are not.

I came across a letter the other day which my father had written to Sir

John Struthers of Aberdeen nearly forty years ago, when the question of anatomy and the examinations in anatomy was under discussion.

> General Medical Council,
> London, 12*th July* 1880.
>
> My dear Sir,—Since I came to London I have been making inquiries into the practice, both in London and Cambridge, pursued by the medical authorities as regards the periods of the anatomical examinations. At the College of Surgeons of England, although the examination in anatomy takes place at the end of the second year of study, yet the final examination comprises an examination, both written and oral, in topographical anatomy. In Cambridge, although the candidates for the *degree of M.B.* are admitted to the examination in anatomy and physiology at the end of the second year of study, all candidates for the *Surgical degree* have to go through a subsequent examination, both written and oral, in surgical anatomy, and the Professor of Anatomy is one of the examiners. At the University of London, questions in surgical and medical anatomy form a part of the final examination for the degree of both Bachelor of Medicine and Bachelor of Surgery, whilst for the final examination for the degree of Master of Surgery, candidates are required not only to answer questions on surgical anatomy, but to dissect a surgical region.
>
> It is clear, therefore, that these bodies do not, as some of your colleagues have argued, give up the testing of a man's qualifications in anatomy before he begins his third winter of study, but make an examination in anatomy, when the qualification to be conferred is a surgical qualification, a part even of the final examination. Our colleagues, who have taken up a position antagonistic to anatomy, appear to have forgotten that a Scottish University degree examination is for a degree in surgery as well as for a degree in medicine, and that if we were to cease to examine and educate in anatomy before the beginning of the third winter, we should lower our educational standard, not only below that of the Universities of London and Cambridge, but even the English College of Surgeons.
>
> If you should be driven to make an appeal to the Privy Council, which I trust may not be required, the practice of London and Cambridge as regards their surgical qualifications should be referred to.
>
> Wm. Turner.

It seems to me that there we have a means to an end: could not a further examination in anatomy be held in connection with our final examinations?

Mr. Dowden said that it would be a great help to the student if he began the study of surgery as early as that of anatomy. As a demonstrator in the anatomy rooms he had always found that he could interest the student by associating the dissection with some practical surgical point. He was of opinion that the junior surgeons and specialists should act for a time as demonstrators of anatomy. Their clinical outlook would give the subject a living interest to the student.

Mr. Miles, referring to the need for co-ordination in teaching, suggested that not only should the anatomist take a share in the teaching of the clinical subjects, but that the clinicians might go back from time to time and aid the anatomist, by directing the attention of the students to the anatomical points which have a direct and important bearing on their clinical work. So far as surgery is concerned, this object is partly achieved by maintaining the old

Edinburgh tradition that all the younger surgeons spend a probationary period as demonstrators of anatomy. He dissented from the view that had been expressed that anatomy should not be merely ancillary to the more clinical subjects. If anatomy is not to be the hand-maiden of surgery, he did not know what it is to be. In teaching students, the primary object of the anatomist should be to make anatomy ancillary to the clinical subjects.

Mr. Wood said that as a demonstrator of anatomy he had been very much struck by the great interest the student takes in any surgical point to which his attention is drawn in an anatomical demonstration, and emphasised the value of impressing the facts of surgical importance on the student during these demonstrations.

Dr. Chalmers Watson said the interest of the student would be enormously increased by bringing into greater relief from the very outset the vital aspect of his anatomy as it can be revealed by X-ray work, *e.g.* in relation to the thoracic and abdominal organs and the joints.

Dr. F. D. Boyd said that it was most desirable that some means should be found of so co-ordinating the teaching that the student should retain his knowledge of anatomy after leaving the dissecting-room. Speaking as a teacher of medicine, he found that when the students first came to the wards, just after passing their anatomy examination, their knowledge was fair, but by the time they came to the final examination it seemed to have been lost. He did not refer to such matters as the finer anatomy of the central nervous system, for which, if he meets with a difficult case, the practitioner can fall back on the text-books, but to ordinary gross anatomy. In practice it is necessary to know the normal anatomy, and how by the physical signs the subject is not normal. He did not know where the fault lay, but the teachers of medicine had to face the fact that the student appears not to have paid sufficient attention to recall what he had been taught by the anatomist.

Mr. Wilkie asked for further details as to how the co-ordination between teachers of anatomy and the clinical subjects is to be carried out.

Dr. Rainy.—There is no doubt that when students appear at the final examination they have forgotten much of their medical anatomy. That this is not the fault of their anatomical teachers is shown by the fact that the same students, when they commence clinical medicine in their third winter, have quite a fair knowledge of regional anatomy. Unfortunately, they fail to carry on this knowledge through the subsequent years of the curriculum. In part the blame for this rests with their clinical teachers, who, amidst the multitude of facts which they have to impart, are apt to assume that their students will themselves keep up their anatomical knowledge. This, in the case of the majority of students, is a mistake ; and unless the facts of anatomy are constantly recalled during the ward teaching, the bulk of the class will neglect to refresh their memories on a subject which is essential to a right understanding of disease. The clinical teacher should therefore utilise drawings and anatomical casts of the viscera *in situ*, as well as demand verbal answers from the students in tutorial classes and also in ward cliniques.

Other clinical aids to the appreciation of medical anatomy, such as X-ray photographs, have their place also, but the place is a subordinate one. Skiagrams represent not direct facts in anatomy, but shadows of these facts ;

and, like all shadows, are capable of almost infinite distortion. It is only after the student knows his normal anatomy that the use of radiographs is likely to be of any value ; as a substitute for direct anatomical observation they will only lead to erroneous conclusions.

Probably the only way in which we are likely to maintain and broaden the anatomical knowledge which is fundamental for the appreciation of "internal medicine" is by a fuller co-ordination between anatomy and the later subjects of the curriculum ; and this can best be achieved by the teachers of anatomy conducting during the later years of the curriculum special courses on medical anatomy, by the clinical teachers building their instruction more definitely on an anatomical basis, and by the more systematic introduction in the final clinical examinations in medicine of questions on such points in the anatomy of the viscera and nerves as are basal for a proper understanding of disease.

Dr. Traquair referred to the difficulty of obtaining sufficient anatomical material to admit of the student making a thorough study of certain parts, particularly the organs of special sense.

Professor Lorrain Smith.—The club is agreed that we must do our utmost to bring the teaching of anatomy into relation with the problems which the student has to face in his hospital work in general medicine, in general surgery, and in the special subjects. There is another question which we have rather neglected—the teaching of minute anatomy—which is a vitally important question in connection with the development of the teaching of anatomy. We in the pathological department feel the lack of the students' knowledge of the normal anatomical minute structure of the body, and we often wish that their information could be more real and more extensive, and that they should have a familiarity with the appearances and variations of structure which appear normally in the human body before they come to pathology ; for example, one has often to begin teaching them what lymphoid tissue is. They never realise that this is of any importance in the structure of the body. Professor Elliot Smith's suggestion is that the teaching of anatomy should be so conducted that it is throughout both macroscopic and microscopic. Speaking from the point of view of pathology, we would hope, should this be carried out, that the student would come to us much more interested in the histological and structural aspect of the problem of the study of disease. No doubt it is a question of time, but it would be profitable to sacrifice something in order to get it fully realised.

This leads me to a point as to whether these sciences are to be taught as ancillary to the practical sciences of the profession. We have to get into the minds of the students the idea which lies at the bottom of these sciences, and in order to do that we must try to interest them in the science for its own sake to begin with. They carry the interest of the anatomical idea, the physiological idea, the therapeutic idea, on into their practical work. It is most important that they should get into their heads thoroughly the anatomical idea, to show them the exceeding interest of the development of structure, the tenacity with which the organism holds to its structure, the way in which it tries to recover its structure when it is destroyed by pathological conditions, etc. ; similarly with the physiological idea—how far the various functions of the organ can be varied under physiological conditions to begin with, and latterly how the organism in acute or chronic disease struggles to reassert the physiological activities of the organs in process of recovery. I think we have to keep in mind that we are teaching the student to think physiologically, anatomically, and zoologically at the same time as we are equipping him for the utilitarian purposes of the medical profession. I do not think we should rely too much on trying to engage his interest *because* it will be useful to him some years afterwards. We must engage his interest because the subject in itself is of exceeding interest to anybody who takes the trouble to study it. Call it morphology, or physiology, or what you please, the scientific interest of the study of these things is, if you get the mind of the student arrested, overwhelming. I think if this is so, he will become later a more scientific doctor or surgeon. If you take sufficient trouble with your students, it is perfectly marvellous the way in which their minds awake to the interest of the question. I have a group of students just now studying pernicious anæmia, and the interest with which they are carrying it out is wonderful. These men, when they come to deal with patients suffering from anæmia, will feel the benefit all their lives of having been thoroughly inspired with the desire to investigate this point as far as they possibly can, and get all the light which pathology and medicine have been able to throw on the subject. They also take up tuberculosis and the spread of tubercular disease. The fact that they have gone into the pathology of it as minutely as they can, will turn out to be of enormous benefit to them when they come to deal with the subject practically in their clinical years or in their graduate life. Thus I hardly agree with Mr. Miles.

Mr. Miles.—I think you have proved my point to the hilt.

Dr. Byrom Bramwell.—Does Professor Robinson think the teaching of anatomy as applied to surgery would be better done by the anatomists or the surgeons? It always seems to me that the surgeons and the specialists and the physicians, who must make a profound study of the anatomy of their special department, are far more fit to teach the senior student than the anatomist, who has not the direct knowledge to bring to bear on the special points of interest.

Dr. Sillar.—One of the great defects of the study of anatomy is that you are dealing with the machine apart from all movement, and the lifeless tissue does not tend to stimulate enthusiasm for it. Might some sort of demonstrations taken very early on the living body not obviate that lack of interest by showing the relation of the structure to the activities of the body. Would not the interest of the students be stimulated by seeing certain of these movements actually in the dissecting-room—for example, the circulation of the blood. The study of anatomy has been divorced from the study of physiology very largely, because they happen to be situated in different departments: might it not be useful in the first stages of his anatomical studies to show the student the circulation of the blood in, say, the web of the frog under the microscope; and to carry that a little further in the living subject, under anæsthetics, to show the movements of the muscles—things, for example, that the physiologist does not necessarily deal with, because these movements are what one might call the coarser movements of the body. The physiologist deals with the niceties of the body and the finer physiological processes, but the actual anatomical movements of the muscles demonstrated might have an extraordinarily stimulating effect upon the students' minds.

The anatomists have all taken for granted that the dissection of the human body is the best means of learning anatomy. Is that really true? I learned far less from my own dissections than from the beautifully dissected preparations in the dissecting-room. I would like to know whether the anatomist really thinks it essential that the student should dissect the whole body—whether it would not suffice to dissect thoroughly one part of the body, and then study the rest of the anatomy on dissected preparations.

I know that I learned a very great deal of anatomy largely by rote, and that in itself destroyed an enormous amount of interest. I never could remember which vagus nerve supplied the front and which the back of the stomach. When you get to that condition of guesswork the subject becomes uninteresting. It was not until the embryologist pointed out that the stomach, being originally an antero-posterior organ, the one came round on the one side, and as the stomach turned round the left vagus will still remain in its position. The little embryological fact stuck in one's mind.

Dr. J. S. Fraser urged the importance of the student studying more closely by dissection the anatomy of the organs of special sense.

Professor Waterston said in reply.—We have had, very much as I expected, the subject looked at through different spectacles. The surgeon wants anatomy taught surgically, the radiographer from the standpoint of X-rays, and the ear, nose, and throat specialist would like more attention paid to these organs. The anatomist has to decide what to teach, with the means at his disposal. I quite admit we may sometimes be in fault in teaching unimportant minutiæ. But who is to settle this? When you look at it from the standpoint of different specialists there is hardly a single anatomical fact in the whole of the body that is not significant. I have been struck with the extreme importance of almost every minute anatomical detail one can think of. For this reason a phrase which always annoys me is "points of special interest." My own experience agrees with that of the chairman, that it is not necessary to go out of one's way to excite the interest of the students in the point at issue. Students, when they have the thing put before them, have a real and deep interest in the question, and extraneous aids are quite unneeded. As an instance of this I may refer to some of my students who are investigating different problems quite without any suggestion on my part. They asked me if they might prosecute some original work. One group wished to work on the cerebral convolutions, and another is studying the development of the vermiform appendix.

From one standpoint, anatomy is undoubtedly an ancillary subject; yet surgery is largely an outcome of anatomy. I prefer to say that one of the roots of surgery is growing in the field of anatomy. To teach anatomy purely from the applied standpoint spells nothing but deadness in anatomical instruction.

When Dr. Chalmers Watson suggests such improvements as he has done, he must surely be quite ignorant of the equipment of modern anatomical departments, which are now well supplied with X-ray photographs.

I agree with Professor Lorrain Smith as to the association of histology with coarse anatomy. As a matter of convention the teaching of histology is not left to anatomists. Probably it would be better if it were, although it would necessitate additional staff and equipment. One does, however, teach the elements of histology by means of micro-projection. Dr. Sillar's remarks about embryology in relation to anatomy were most instructive, and I can give him many other instances showing that embryology is an essential part of human anatomy.

PROFESSOR ROBINSON said in reply.—I am in agreement with much that Professor Elliot Smith's paper contains, and I am at one with Professor Waterston and Professor Elliot Smith in thinking that histology should be taught in the anatomy department. You ask, quite rightly, that anatomy should not be taught simply as a technical subject, but, in that case, if we ever teach histology, you should not ask us to teach human histology only, without reference to its general scientific bearing. Personally, if I were teaching it I should wish to deal with it chiefly from the medical point of view, but to throw any insight into it, it would be necessary to refer to outside points at the same time. It might be possible to make human histology the basis, and tack the rest on to it; whereas at present comparative histology is the basis, with human histology tacked on to it. I am glad to find that Professor Elliot Smith is of the opinion that anatomy should be carried on into the later stages of the course.

With regard to the question of the junior surgeons teaching in the anatomy department, my experience in London was that you could not get the junior surgeons, because they feared they might infect their patients, and it was stated that in the hospitals where it was allowed the results were not so good as in the others. We have not yet suffered in that way in Edinburgh. With regard to our "subjects," they are perhaps less likely to infect anything or anybody than anything else in the town, and I think the applied anatomy ought to be taught largely by the junior surgeon and junior physician; they are the people I had in my mind when I was proposing that the subject of applied anatomy should be carried on further in the curriculum. You cannot expect the junior surgeons and junior physicians to give up much time to the anatomy department, however, unless sufficient remuneration is provided. If they give time, it must be a definitely settled period, and not just when it suits them. If the university is prepared to meet the requisite expense, we shall have no difficulty in getting the assistance we require. This opinion probably meets the point of Dr. Bramwell's question as to whether applied anatomy should be taught by the surgeon rather than by the anatomist. I am glad to know that Dr. Boyd and Dr. Rainy agree that the students do know something of surface anatomy when they leave the anatomy department. I cannot say why they do not know it later; but as I had the men in the anatomy department in London both when they were preparing for the second M.B. and for the Final Surgery and Medicine examinations, I can give you my experience there. I had men in London who took the highest places in anatomy, and yet later on, when they were preparing for their finals, they knew practically nothing of anatomy. *We* did not kill their knowledge when they were with us, but it had been killed somehow between the time of leaving us and the time of coming back to us. They soon picked it up again.

We have, incidentally, been accused of not teaching things that are important. Dr. Turner referred to the recurrent nerves. We deal with them, not once nor twice, but many times. The same is true with the nose, which Dr. Fraser states is not properly known by the students. When I want to get together the remains of my "parts" at the end of the term for preparations, my difficulty is to get "parts" which have not been cut to pieces. This shows that the men do go more or less over the nose, and at the time they know something about it. Why do they forget later? Simply because they hear nothing of anatomy, after leaving us, for a long time. They hear about so many other things that anatomy gets crowded out of their heads. With revision they pick it up again, but without continuation you will not have the memory of what they have learned remaining constantly in their minds.

What are we to teach generally, and how far is it to be scientific and how far purely technical? It depends whether you are talking of a small school where you have each individual under your finger, and can interest him or her—sometimes to their detriment—in the things in which you are interested, and incite them to specialise. I think that is to be avoided. In the time at disposal it is necessary to give a general idea of anatomy, as scientific as you can make it, for by far the majority of students in a large school the whole interest lies in, "How am I going to apply it? What is its value to me as a practitioner of medicine?" On the whole, I should be inclined to say, "In the early years do as much as you can in the science and throw in a little practical interest." But I am convinced that you will get more of interest both for the science and for the practical application the more the student combines his interest in anatomy with something he is dealing with at the hospital at the time.

Dr. J. V. Paterson.—If you *examine* on the minutiæ of anatomy, the students will get up anything to get medals and to pass examinations well, and will learn much that can never be of any use to anybody from a clinical point of view.

Professor Robinson.—What *is* of no interest to anybody? What part of the body is there that will not at some time become important? The specialists want more time spent on the organs of special sense and the head and neck, and have not much respect for the thorax, but what will the physicians say to that? So it goes on all round. All that we can possibly do during the time we have—and that ought to be during the whole five years—is to give a good general scientific view, and to draw attention to the practical applications of the subject to surgery and medicine.

Dr. Sillar looks upon anatomy as a dead subject, and says you do not get to know a thing by taking it to pieces. Is there any machine that you get to know without taking it to pieces? The deadness of the "subject" is the very difficulty we have with the students; they tend to look upon anatomy as something to be learned from the dead, and the attempt to look upon it as a living subject is a trouble. If the dissector fails to try to find out what everything he dissects does, he is not taking advantage of his training, as we attempt to give it, at the very outset.

I agree with Professor Waterston that we must, to a certain extent, limit the supply of skiagrams. But even if we had a plentiful supply of skiagrams and other photographs of important parts, taken under standardised conditions, so that their true value could be estimated, they would have to be used with care, for they, like prepared dissections, have the great disadvantage that the student loses in them a proper appreciation of depths.

VIII.—THE RELATION OF PHYSIOLOGY TO MEDICINE.

By J. S. HALDANE, M.D., F.R.S., Fellow of New College, Oxford.

In spite of the great and striking development of physiology, and of the teaching of it, particularly on the practical side, there is a considerable, and in some respects growing, want of contact between physiology and practical medicine and surgery. As Professor Frederic Lea of Columbia University put it in a recent paper (*Journ. Amer. Med. Assoc.*, vol. lxvi. p. 640): "During their first or second year, or in both, the students receive their instruction in physiology. Most of them follow the course willingly because they have faith in the wisdom of the men who have planned the course, and faith that in some way not now clearly comprehended their training in it will be useful to them later. Nevertheless, too many students question the good judgment that imposes on them a difficult topic, the relation of which to the treatment of sick persons they do not understand. By the end of their second year they have completed their work in physiology, and lay the subject aside with a feeling of relief as they turn to the more congenial occupations of their two clinical years. Now they acquire a new vocabulary for which all along they have been longing. . . . With the passing of the physiologic words go also their meanings, and throughout the rest of the school career, and too often the rest of professional life, physiology is merely a scientific curiosity."

I wish to make some suggestions as to the causes of, and remedy for, the defects in living contact of physiology and the other immediately preparatory branches of medical study with practical medicine and surgery. I do not think that the causes lie so much on the surface as might at first be supposed. We have, I think, to dig rather deep to discover them, and to dig into a controversial subject. Hence I can hardly look for general assent to my conclusions. I hope, nevertheless, that they may at least give rise to a fruitful discussion.

The aim which medicine and surgery have constantly before them is to help in restoring health and preventing ill-health. Now let us first try to see from actual examples how medical and surgical interference can contribute in this direction. Though I have been outside ordinary medical practice ever since I was house-physician at the Edinburgh Royal Infirmary, my work has kept me in contact with many problems of preventive medicine; and recently the war has brought me, like most other physiologists, back to ordinary problems of practical medicine. I will therefore take as examples one or two medical problems with which I have recently been in contact.

The first of these relates to the treatment of the acute stages of poisoning by ordinary lung-irritant gases, such as chlorine, phosgene, or trichlor-methyl-chloroformate. Some hours after a serious exposure to one of these gases the soldier begins to present very dangerous symptoms. The colour of the lips and face becomes either blue or leaden coloured: the pulse is rapid, and may be feeble and irregular: the breathing is increased, and a watery sputum is coughed up. At the same time the senses become dulled, and coma may supervene.

What is the meaning of this symptom-complex? Let us begin with the colour of the lips and skin. Evidently the blood in them has no longer its ordinary scarlet colour. This might be due to decomposition of the hæmoglobin by the poisonous gas, with formation of methæmoglobin or other decomposition products. But we can negative this theory very quickly by taking a drop of the blood, diluting it with water, saturating with carbon monoxide or coal-gas, and comparing the tint of the solution with that of normal blood similarly treated. The hæmoglobin shows no trace of decomposition; and if it had occurred, the colour of the lips would have changed immediately after the exposure to the gas, and not many hours later. The colour of the lips is therefore due to the presence of reduced hæmoglobin, as in any ordinary true cyanosis.

This cyanosis might be due either to great slowing of the circulation, or to deficient oxygenation of the blood in the lungs. There is, however, no sign of the cold skin and other evidences of great slowing of circulation; and in many cases the blood-pressure is still high, along with great cyanosis. It is evident, therefore, that the main cause of the cyanosis is deficient oxygenation in the lungs, and this in spite of vigorous and rapid breathing, which is evidently not obstructed by contraction of bronchi. The cause of this deficient oxygenation is made evident by post-mortem examination of similar fatal cases, as well as by the character of the sputum. The lung alveoli contain large quantities of albuminous liquid, and the alveolar epithelium is swollen and proliferating. The diagnosis is completed by the observation that on the administration of oxygen the cyanosis clears up and the circulatory and other symptoms improve. By administering oxygen we largely increase the percentage of oxygen in the lung alveoli, and thereby increase in still larger proportion the diffusion pressure of oxygen into the blood. Under normal conditions the partial pressure of oxygen is about 6 per cent. of an atmosphere in human venous blood, and 13 per cent. in the alveolar air, the difference being therefore 7 per cent. With the presence of liquid and swelling of the alveolar epithelium the pressure difference present is not sufficient to drive enough oxygen through to oxygenate the blood at all completely. But we can increase the normal pressure difference as much as ten or twelve times by giving oxygen, so that the oxygen goes in far faster; and usually a quite moderate increase in the oxygen percentage of the air suffices to remove the cyanosis. The increase in the breathing multiplies by several times the pressure difference which enables CO_2 to pass out, so that escape of CO_2 is already provided for.

What, now, are the effects of the want of oxygen indicated by the cyanosis? We can observe some of these effects in mountain sickness, where the want of oxygen, to which, without the smallest shadow of doubt, mountain sickness is due, is produced by deficiency in the oxygen pressure of the air. In this case the want of oxygen is slight, but the nausea, headache, and extreme depression which result after a few hours' exposure to the rarefied air are formidable enough symptoms. Similar symptoms result from slight CO poisoning. With more serious want of oxygen, as in severe and prolonged exposure to CO, or to air very deficient in oxygen, the effects are far more formidable. There is very serious damage to the central nervous system, and both capillary hæmorrhages and large hæmorrhages may occur in the brain. The heart becomes weak and dilated, with the mitral valve probably incompetent. The kidneys and other organs may also be injured; and recovery, if it occurs, is slow and gradual. Evidently, therefore, any serious want of oxygen, if allowed to go on, is a source of great danger, unless the patient has been gradually acclimatised to it, as in some cardiac cases. The breathing, though it is increased, gives no definite warning of this danger. There is, for instance, no marked struggle for breath when a man loses consciousness from CO poisoning or an airman flies to a dangerous height. In phosgene poisoning there is usually no great struggling for breath, as the CO_2, which stimulates the respiratory centre, can easily be got rid of in the lungs.

We can now see that the patient is in the gravest danger and constantly going down the hill from the cumulative effects of want of oxygen, but we cannot undo the damage done to the exquisitely delicate alveolar epithelium; much less can we replace it. We know, however, that if we can keep the patient alive, by obviating secondary dangers, the lung epithelium will of itself return to normal or something like normal. Now it is evident that by the continuous administration of air rich in oxygen we can meet the pressing danger and progressive damage from want of oxygen. To make this administration practically possible it is necessary to have proper apparatus, and I recently devised an apparatus for the continuous administration of oxygen, so that not more is given than is actually required, and none is wasted. This apparatus is in successful use in the clearing stations of our Army, and I hope that apparatus of a similar or superior type may soon be applied in ordinary medical practice for use in the numerous cases where oxygen is, so far as I can judge, required.

By giving oxygen we do not cure the lung inflammation. It might, therefore, be objected that in the long run oxygen is useless, and only prolongs suffering. I wish to emphasise very strongly that reasoning of this kind is radically fallacious, and strikes at the root of practically all medical and surgical interference. What we do by giving oxygen is to keep the patient alive, by preventing secondary injury, until time has been given for the natural processes of recovery of the lung. We are breaking a vicious circle, for the want of oxygen produced by the injury to the lung is hindering, or making completely impossible, recovery from the injury. When the want of oxygen is removed, recovery can take place in a normal manner.

Medical or surgical interference of almost any kind amounts to the same thing. By treating a wound antiseptically or aseptically the surgeon breaks another actual or potential circle; for it is the infection rendered possible by the wound that prevents the wound from healing. The natural healing process is free to go on when infection is got rid of. By the use of anæsthetics another potential vicious circle is broken; and similarly by the use of splints, of operative interference, or simple rest. It is exactly the same with regard to the use of all varieties of drugs. With digitalis or strophanthus, combined with rest, we can often break a vicious circle in heart disease; with thymol we break a vicious circle in ankylostomiasis; with drastic measures for reducing body temperature we break a direct vicious circle in heat-stroke. When the vicious circle is broken, Nature is enabled to re-assert herself. Normal regulation of the circulation returns in valvular disease; the hydræmia, with all that it implies, is recovered from in ankylostomiasis; the normal physiological control of body temperature is recovered in heat-stroke. But at the back of all medicine and surgery is the old-fashioned *vis medicatrix naturæ.* Without this there would be no such thing as medicine and surgery. We cannot repair the living body as we repair a table or a clock. The surgeon is not a carpenter, nor the physician a mechanician or chemist.

Medicine and surgery are always counting on, and trying to understand and aid, the *vis medicatrix:* they evidently cannot get on without it. Here I think we touch the subtle barrier which causes the estrangement between practical medicine and the teaching of the preliminary sciences; for these sciences, as ordinarily taught, pay little or no attention to anything corresponding to the *vis medicatrix.*

Now let us try to analyse a little more closely what is wrong in the gas-poisoning case. The patient is in urgent danger from want of oxygen. But if we measure his actual intake of oxygen we shall probably find that, owing to his restless condition, it is above, rather than below, what is usual for a man lying in bed and without food.

He is only short of oxygen in the sense that the partial pressure of oxygen in the blood of his systemic capillaries is too low for the proper support of life, though there is still much oxygen left in even the venous blood. When he was still moving about, just before being put to bed or laid on a stretcher, his oxygen intake was far above that of a resting man. Yet probably his lips were already blue, and he was in imminent danger of sudden death from shortage of oxygen. This shows clearly that not only must the blood supply an amount of oxygen proportionate to the very fluctuating demands at different times, but the oxygen must at the same time be distributed at a certain partial pressure or concentration. When we measure the oxygen pressure of the venous blood in a normal person it is extraordinarily steady, in spite of considerable variations in its rate of consumption. This relatively steady normal is no longer maintained in the patient, and his symptoms of oxygen want are due, not to an abnormally low rate of intake of oxygen, but to a failure in regulation of the manner in which the oxygen is distributed. The truth is that in a normal person the oxygen supply to the tissues is, like everything else in the living body, regulated minutely from minute to minute. To the *vis medicatrix* of the sick body there thus corresponds a *vis directrix* in the healthy body; and just as the *vis medicatrix* restores both structure and function in the sick body, so the *vis directrix* regulates at every moment the activities of the healthy body. The *vis medicatrix* and *vis directrix* are evidently one thing.

This is an old-fashioned and very gross method of expression, but it at least points to the great salient facts which distinguish an organism from such machines as we know, and completely differentiate medicine from all mechanical and chemical arts. To put the matter in simpler and less misleading language, it is organic regulation of both structure and activity that we are constantly trying to aid and supplement in medicine and surgery.

I do not wish to go into the question whether organic regulation is, or is not, ultimately reducible to mechanism. On this point I have fully expressed my own conclusions elsewhere, but they need not directly affect the matter we are now discussing. My immediate point is this: that in practical medicine the assumption of the existence of organic regulation of both structure and function is absolutely fundamental. Disease is the breakdown of this regulation at one point or another; and practical medicine is simply assistance to Nature in restoring and maintaining effective organic regulation.

Now let us turn to physiology as it is usually taught at present. On consulting a current text-book of physiology one finds an account of the mechanical and physical aspects of each bodily process taken separately. For instance, in the case of breathing, there are descriptions of the structure of the lungs, the mechanism by which air is driven in and out of the lungs, the chemical changes in the air breathed, the means by which gaseous exchange occurs in the lung alveoli, the nervous channels by which inspiratory and expiratory impulses are conveyed from the respiratory centre to the muscles, and the chemical and nervous stimuli which act on the centre. All these things are systematically described one by one, as we might describe the structure and action of a machine. But there is something which is almost totally lacking, for there is no description of the organic regulation which absolutely dominates all the mechanical and chemical details.

When, for instance, we examine the pumping movements of the respiratory muscles we find that they are determined by what is required to maintain at a practically constant partial pressure the carbon dioxide and oxygen in the arterial blood leaving the lungs. If the carbon dioxide production and oxygen consumption are increased ten times, the ventilation of the lungs will also be increased nearly ten times, so as to prevent more than a very slight increase in the carbon dioxide pressure of the blood. If the carbon dioxide percentage in the inspired air increases there is a corresponding result. If the oxygen pressure in the arterial blood tends to fall, it is kept up partly by increased breathing and partly by active secretion of oxygen inwards by the lung epithelium. Failure in these regulative activities produces urgent and dangerous symptoms.

Here, therefore, we have constant, unmistakable, and exact regulation of the quality of the arterial blood by the breathing, and if we examine the structure of the lungs and the nutritive process by which this structure is maintained, the constant teleological regulation or maintenance of structure is no less evident. Now the very expression "teleological regulation" evokes at once emphatic repudiation from most physiologists, as they consider that it savours of mouldy metaphysics. Let us, they argue, keep to facts capable of definite experimental verification, and avoid all doubtful interpretations of them. This, for instance, is what Huxley expressly aimed at in his admirably written *Elementary Physiology*.

Now I entirely agree with this contention ; but the question remains as to what *are* the facts. It seems to me that, quite unconsciously, Huxley, and the whole physiological school which he typifies, misrepresented them very seriously, and in the manner which is really responsible for the existing and very detrimental estrangement between practical medicine and the preliminary medical sciences. It is quite evident that the breathing is regulated in the manner just described. One can verify it with the greatest ease. But if we teach physiology as if it dealt with a series of essentially unconnected events, like the workings of the separate parts of a machine, we misrepresent the facts.

We know, for instance, that under ordinary conditions the presence of a certain very minute excess or deficiency in the pressure of carbon dioxide in the alveolar air will cause great increase in the breathing, or bring natural breathing to a complete standstill. This seems simple and definite; but as soon as we alter the conditions by diminishing the normal pressure of oxygen in the air, or interfering with the circulation, or over-driving the muscles, or making the diet abnormal in certain directions, or in various other ways altering the "normal" conditions, the statement is no longer true. The definite effect of the CO_2 is no longer the same. The effect depends very directly on the normal functioning of the body as a whole, and its immediate environment; and when we consider the alteration in the effect we find that it is again regulative in the sense of contributing to maintenance of the normal, though in a wider sense than before. Thus we have still before us the fact that bodily functions and structures with their immediate environments have the peculiar characteristic of tending very strongly to maintain the normal. The parts and workings of a machine show no such behaviour.

To take another instance: we know from the investigations of Hering and Breuer that distension of the lungs to a certain point inhibits inspiration and initiates expiration, while emptying the lungs to a certain point has the converse effect, these effects being reflexes of which the vagus nerve is an afferent channel. By itself this knowledge was quite unintelligible. It seemed to suggest that inspiration and expiration are events following one another in response to certain stimuli which are quite independent of the gases in the blood, whereas we now know, as already pointed out, that it is the gases in the blood that immediately regulate the breathing. But further investigations have recently shown that the degrees of expansion or contraction of the lungs at which the reflex occurs are dependent on the blood gases. If, for instance, the carbon dioxide in the blood is first reduced by forced breathing, so that the state of apnœa is produced, the slightest expansion of the lungs will initiate expiratory effort, while the slightest contraction will initiate inspiratory effort. Hence the breathing movements are jammed, and if we attempt to apply artificial respiration by Schäfer's or any other method unaccompanied by considerable violence, hardly any air passes in and out. If, on the contrary, excess of CO_2 is allowed to accumulate in the blood, the reflex is so modified as to permit of deep inspirations and expirations. Organic regulation thus dominates the reflex, and the account of it which has passed muster for fifty years is thus imperfect. A very large and quite common group of clinical symptoms, including those with the military designation of "disordered action of the heart" and "chronic gas poisoning" appears to be due to an upset of this reflex, with consequent very shallow and therefore rapid breathing, and want of oxygen and excess of CO_2, with all that these bring with them.

When we examine the circulation we find the same kind of constant regulation from minute to minute as in the case of respiration; and it is the breakdown of the regulation that we have to do with in illness. But of this regulation we are often given hardly an inkling in the text-books, though there are abundant and tiresomely minute details about the mechanics of the circulation.

It is the same with the kidneys. There are long and very inconclusive discussions of the possible mechanisms of secretion, but hardly any attention is given to the absolutely dominant fact that, in whatever way the kidneys accomplish it, they are constantly engaged in regulating the composition of the blood with a fineness which is almost incredible till one attempts to measure it quantitatively in the same way as the fineness of regulation of the breathing or circulation is measured.

To whatever part of physiology one turns one finds evidence accumulating of the fineness and omnipresence of organic regulation. One necessarily misses this regulation entirely if one takes processes and organs one by one, and not in relation to the whole life of the organism. Illness is disturbance of organic regulation: consequently physiological teaching which disregards organic regulation has but little direct reference to medicine, and can be of relatively little help. A capable doctor has to neglect, to a large extent, the physiology he has been taught, and he has to make for himself a new, and often very crude, physiology.

If modern teaching of physiology is defective, so, to a far larger extent, is that of anatomy. Human anatomy frankly professes to deal only with the gross structure exhibited by dead bodies, whereas medicine has to deal with the living body. Now, it makes all the difference whether the body is alive or dead. The living body maintains, by a process of ceaseless and exquisitely regulated activity, the appearance which we call its structure. In disease the regulation is disordered, and in the process of recovery we see the restoration of this regulation. But anatomy disregards completely both the activity and the regulation of it. It frankly does not profess to tell us anything about the conditions which determine the fact that normal and not abnormal structure is present. Of the possible presence of a *vis sculptrix* corresponding to the *vis medicatrix* it has never even heard. "Natural selection or a Creator have just made structure what it is," say the anatomists, "and we cannot give any further information." The medical man has to struggle how he can to solve the problems which arise when either disease or he himself interferes with normal structure. Anatomy does not stretch out even a finger to help him in this struggle: it deals only with the dead. What help there is comes from experimental embryology and physiology, the recent work of the Edinburgh Physiological School being specially prominent in this direction. In this country the physiologists have annexed to themselves the study of the microscopic structure of the body, besides inventing, in addition, an ultra-microscopic structure. Of the great future science of experimental anatomy only the germs exist at present. Human anatomy behaves as if she had sold her scientific birthright for a sorry mess of what may be called "systematic" pottage.

Pathological anatomy has, of course, suffered from the same deficiencies as normal anatomy. To many medical men the pathologist is a sinister figure which stalks behind the chaplain and in front of the undertaker, and which is constantly peering over the shoulder of the consultant and whispering suggestions of morbid changes which, like the normal anatomical structure, just come out of the blue, and which hopelessly sentence a patient to death or permanent disability. My intellectual as well as moral sympathies are all with the cheery general practitioner whose motto is "Never say die," and who flashes defiance at this dismal ghost.

On the side of abnormal function pathology is, of course, quite as active as physiology, but seems to me to suffer grievously from the defects of physiological teaching. For, in the main, experimental pathology sets out with the same limitations that keep the physiologist out of contact with practical medical work. When the normal organic regulation of physiological activity is almost ignored by physiology the pathologist is, of course, diverted from laying his finger on the nature and causes of failure in the regulation and on the processes which lead to that re-establishment of regulation which constitutes recovery or adaptation.

Let me give one more illustration from my own experience. Work on the health conditions at metalliferous mines, quarries, and factories brought me into contact with the terrible phthisis mortality which sometimes results from dust inhalation. The effect is mainly due to siliceous dust, such as that from the Craigleith sandstone formerly used in Edinburgh, or from millstone grit, gannister, Transvaal quartzite, or the powdered flint used for pottery work. But in many industries men are also greatly exposed to dust, and even dust consisting largely of crystalline silica; yet no excess of respiratory trouble attacks them. Coal-miners, for instance, breathe much dust, and with it a great deal of siliceous dust, but suffer even less from phthisis than agricultural labourers; and one finds men who have worked for decades in very dusty crushing mills, where extremely hard stone is crushed, containing 70 per cent. or more of silica, and yet they show no signs of ill effects. It seemed clear that much is hidden behind the name "pneumoconiosis"; but what? Evidently the first thing to do was to find out whether, and by what means, the lungs get rid of a harmless dust, such as coal-dust or shale-dust. The microscopic work was carried out by Mr. Mavrogordato at my laboratory, with the financial support of the National Medical Research Committee, and resulted in showing that though with ordinary exposures the harmless dusts enter the lung alveoli in large amounts, the dust is all got rid of after a certain time. It is carried out by dust-collecting cells along several paths. In the case of pure siliceous dust, however, the transport fails, or is very slow, though the dust is collected in cells as before. The dust-containing cells remain, therefore, in the walls of the lung alveoli and elsewhere, with results which ultimately become disastrous. When, however, there is a mixture of siliceous dust with the ordinary dusts which stimulate transport, the whole of the dust is carried out.

Hence, as soon as we got some understanding of the normal regulation of dust elimination we could lay our fingers on how this regulation breaks down in the case of pure siliceous dust, and suggest a possible remedy. If we had simply asked what the immediate effects of dust inhalation are, we should have got nowhere; for the immediate effects seem to be much the same for all kinds of dust, and if enough of dust is inhaled rapidly, pathological results follow in all cases. The proverbial black spit of the collier is in reality just as healthy a sign as the increased breathing caused by muscular exertion, or immunity produced by a vaccine.

In connection with the phenomena of immunity, pathology has not waited for physiology, but has gone ahead on the right lines and practically created a new branch of physiology on the way. In many other directions, however, pathology seems to me to have been kept back by the imperfect conceptions which hamper physiology and anatomy; and this is still more strikingly true of pharmacology. The truth is that anatomy, physiology, pathology, and pharmacology are all branches of the one science of biology, with no definite dividing lines between them; and all should be definitely and explicitly based on the distinctively biological conception of organic regulation. This marks them off from other preliminary subjects, such as mathematics, physics, and chemistry.

No doubt I shall be reproached for trying to re-introduce obsolete teleological conceptions into physiology and medicine, but I shall not attempt to deal with this reproach now. What I have tried to show is, that whatever may be the ultimate conclusion about teleology, there can be no doubt that practical medicine is based on a teleological conception of the working of the body, and that because physiology, as ordinarily taught at present, ignores this conception, there is but little living contact between physiology and medicine as a curative art. In other words, physiology, and with it the other preparatory biological sciences, is not taking its true place as Institutes of Medicine, to use the Scots name. This is my diagnosis of the main underlying cause of the want of connection between these sciences and medicine.

As to the remedy, this lies mainly in the hands of the teachers; but I think that the defect is now tending to disappear. The days of too exclusive attention to muscle-nerve preparations, the mere physical structure of dead tissues, and the mere chemistry of the body fluids and dead tissues, is past; and human physiology is taking a more and more important place in research and teaching. With the human subject of experiment the teleological mode of approaching physiological problems is inevitable, and *pari passu* physiology is coming closer to medicine. The study of immunity is also tending to bring pathology closer.

I have criticised the present-day teaching of physiology, anatomy, and pathology, but I want now to urge with all the emphasis I can that whatever may be their present shortcomings, the group of preliminary sciences represented by physiology, anatomy, pathology, and pharmacology form the future basis of practical medicine. The rest is only subordinate detail, changing from year to year and from place to place, and only surviving through the contributions it is constantly making to these sciences. Practical medicine is one of their active growing points—perhaps I should say their main active growing point—nourished by the mother earth of new experience. The medical art which is not grounded on these sciences is bound to become more and more of an anachronism. Treatment can only be securely founded on a correct and full diagnosis of what is amiss in organic regulation and how Nature can be aided in restoring the regulation. But diagnosis is far more than the mere giving a name to a morbid condition. The practical problem is always as to how in each particular case there is deviation from health, and how in each particular case Nature can be aided. In solving these problems scientific knowledge is indispensable. It is "with brains, sir," that the physician mixes his prescriptions and the surgeon guides his knife.

This means that the preliminary sciences must go with the medical man to each bedside and guide him at every step. As regards clinical demonstration and instruction in medicine and surgery, I think it means that we must more effectively install the active prosecution of the preliminary sciences at the bedside, and not merely leave scientific investigation behind in special laboratories. The diagnosis and treatment taught to students cannot possibly be progressive unless the teachers are progressive in the personal prosecution of scientific knowledge. At present the majority of medical and surgical teachers are so busily engaged in private practice that they cannot devote the necessary time to the details of scientific research, with its ever-increasing complexity of methods. I wish, therefore, to make certain suggestions for the remedy of this state of matters.

In the first place, it seems to me essential that real clinical laboratories should be established to help in the investigation of living patients and methods of treatment. A single good room in connection with the service of each visiting member of the hospital staff would probably suffice for this purpose. For the research work to be carried out in each laboratory it would be absolutely necessary to have the services of a competent paid assistant. His duties would be, firstly, to carry on research work under the general direction of the physician or surgeon, and, secondly, to act as the intelligence officer connecting each clinical laboratory with the main university or other laboratories, and with other clinical laboratories. He would have to see to the details of experimental methods and get information as to how to work them. The apparatus and chemicals would only be what is needed for observations on normal or abnormal human beings, and this apparatus, when done with for the time, could be returned to a storeroom in the hospital, or to any other place from which it had been temporarily borrowed. Experiments requiring the use of animals or of considerable space would be much better done in the main university or other laboratories.

The appointments of such assistants would be very important, and would, I think, be much sought after. The work of these laboratories would bring new life and stimulus into the work of the wards, and would also, I feel sure, react with equally stimulating effect on the main laboratories. In my own experience practical human problems have always been an enormous stimulus to new physiological work and new ideas. The study and means of control of chronic diseases would, I think, benefit very particularly from these clinical laboratories.

Another suggestion which I should like to support is that the holders of chairs of systematic medicine or surgery should be freed from private practice. I cannot see how they can efficiently perform their very important duties otherwise, for they ought to keep in close and living contact with all parts of their subject, besides superintending the development of new forms of treatment and scientific investigation in the wards under their charge. The time has come, it seems to me, for placing these chairs on the same footing as other chairs in the Medical Faculty.

In a recent visit to America nothing struck me so much as the extraordinarily rapid development of medical teaching and research in the best universities. In place of the pompous ignorance of physiology and pathology which one meets with so often among medical teachers in Europe, there was everywhere considerable knowledge of, and enthusiastic belief in, scientific methods. Clinical laboratories, and keen young men to work in them, were appearing in all directions. Side by side with this clinical scientific activity there was an equally marked development in the pure scientific laboratories and their research work, and in the broadness of view which goes with originality. Other features were the introduction of whole-time professorships of medicine and surgery, and the system adopted by some of the leaders in American surgery and medicine of only carrying on private practice in hospitals so organised and staffed that patients could be thoroughly examined, skilfully tended and observed, and placed in the best conditions for successful treatment. I returned home with the strong conviction that we shall soon be left behind in the medical sciences unless we can introduce radical reforms. It was largely this feeling that led me to venture to open the present discussion with the somewhat iconoclastic views and proposals which I have now laid before you.

Let me add some concluding words. A human being is far more than the mere organism with which medicine and surgery are immediately concerned. To a good doctor his patients, as fellow-men, have a value which cannot be measured; and he has constantly to deal with them on the human side and adapt his treatment to it. If he fails to do so he emphatically fails in his duty. In thinking of the scientific side of medical education we are sometimes apt to let the human side slip, and forget that an essential part of medical education consists of those subtle influences, exercised mainly by example, though partly also by special instruction, which teach sympathy with and understanding of human personality. If, therefore, medicine is to have more science and less rule of thumb, let us see to it also that with the science goes more humanity, and, where possible, a broader general education, not in the mere dry bones of the humanities, but on living humanistic lines.

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IX.—THE POSITION OF SYSTEMATIC LECTURES IN THE CURRICULUM.

By Sir EDWARD A. SCHÄFER, F.R.S.

By the term *systematic lectures* I mean a complete instructional course given in the form of a regular series of lectures attempting to deal with the whole of the subject to the extent required by the student. For most of the subjects of the medical curriculum, such complete systematic courses are rendered unnecessary by the number of excellent text-books with which the student is furnished and from which the teacher can make his choice. By far the majority of people have a better visual than oral memory, and although a well-delivered lecture may be impressive at the time, the details soon fade, leaving little that is accurate. At the time that I studied medicine, and for a considerable time after, there was little or no choice of text-books—very important subjects, including physiology, had none which could lay claim to be either authoritative or accurate—and the student was compelled to rely entirely on lecture instruction. As a result of this, no student ever attempted to get up such a subject as physiology without attending the same course of systematic lectures twice—some found it necessary to take them out even a third time. Nowadays, with the text-books we possess, it would be quite possible for a fairly intelligent youth to pass any theoretical examination without having attended a single course of systematic lectures. It may, it is true, be urged that the personal presentment of the subject by a man who is master of it is more likely to impress the important features upon the mind of the student than the mere reading of a book. But against this line of reasoning it must be pointed out that eminence in a subject does not always carry with it the gift of exposition to students; indeed, we must all of us have known eminent men who have been quite unable to fix the attention of a class on the subjects they have attempted to expound.

I may, perhaps, be asked, "Would you entirely abolish lectures and make the student learn his subject by reading and by practical work alone?" To this I reply, "By no means." I would, however, let observational work—a term which I use to include practical work of every kind—occupy the chief place in the curriculum; and this for all subjects without exception. Lectures may be given in connexion with the practical work, to show the bearing of observations—experimental or other—in illustrating the theoretical aspect of the subject.

And in some subjects, not in all, a short introductory course of lectures dealing with general principles would be useful, although only *necessary* where the subject is unusually complex or strange to the student.

The introductory course I am contemplating must precede the regular instruction in observational work. Such a course would, as I have said, not be necessary in all subjects, but in some, such as physiology, which is vast in itself, and the principles of which underlie the whole study of medicine, an introductory course appears to be required, and would occupy a part of the preliminary period (first year) during which anatomy and microscopic anatomy are also being taught. It is a mistake to try to force students to acquire in a single academic year a proper acquaintance with the problems presented by physiology, considering that they come to the subject as entire strangers, having but little knowledge of anatomy and none of microscopic anatomy. The knowledge of physiology that they need for their examinations can only under these circumstances be acquired by a system of organised "cramming," which involves a serious strain both on teachers and taught. The teacher is compelled all the time to try and get a quart of instruction into a pint pot of intelligence, with the inevitable result that a large part of the valuable liquor he puts in brims over, and a disproportionate amount of his energy runs to sheer waste.

Although opposed to the continuance of systematic lectures, there is a class of lectures which I would willingly see encouraged, viz. special lectures on a definite branch of the subject. Such special lectures should be given by a person who has made a special study of the particular matter to be treated of. He might be the professor himself, or one of his assistants, or one of the workers in his department, or an investigator altogether outside the university, invited personally to place before the students the results of his own work. Lectures of this description would be highly valued by the students, especially by those who take a keen interest in their work, and in my experience these are in the majority. Nevertheless, strange as it may sound, instruction of this nature, although encouraged elsewhere, is discouraged by the regulations of this university.

I cannot sufficiently accentuate that the great mistake in our present curriculum is the insisting upon a hard-and-fast rule for all subjects, and constraining the student to attend an unnecessary number of so-called systematic lectures in order to obtain information which he can get in far less time from the intelligent study of a good text-book. Different subjects of the curriculum require different methods of treatment, and the position which lectures should occupy in the teaching of one subject is not necessarily the criterion for another. More elasticity is required. Every experienced teacher knows how best to teach his own subject, and it may well be left to him to arrange the time which can be devoted to it to the greatest advantage of his students, without attempting to bind both him and them down to a cast-iron system which has become antiquated and ought to be discarded.

X.—THE RELATION OF THE PRELIMINARY SCIENCES TO THE CURRICULUM.

By Sir EDWARD A. SCHÄFER, F.R.S.

THE position I take with regard to the preliminary sciences in the medical curriculum of the university is that they have no business there at all. Five years is the most that can usually be given by the student to the acquisition of the technical knowledge needed by the practitioner, and is all too short for the essentially medical subjects. It is not possible, or, if possible, it is not desirable, that this time should be added to. Five years is a large slice out of a man's educational life, and every additional year adds greatly to the expense of a medical education.

It is at last coming to be conceded that instruction in natural science—which includes physics, chemistry, and biology—must be an integral part of the education of every boy and girl up to about 16 years of age, sharing until then with other branches of education the time of the school curriculum. No subjects are more easily taught to children than the natural sciences, by reason of the interest they excite and the objective manner in which instruction can be imparted. After 16, whilst the general education is being continued, a certain amount of specialisation would be allowed; this specialisation should be adapted to meet the needs of the career which the boy is intending to follow. Thus for law, or divinity, or a literary career the classics (including, of course, English) would occupy the prominent position; for commerce, modern languages and geography; whilst for a career to be devoted to manufactures or engineering or medicine, those branches of science which will be specially needed for the particular profession in view would be the important subjects of training.* It follows that a boy who intends to devote himself to the study of medicine, and who has already, by the time he has attained the age of 16, been grounded in the elements of the natural sciences, may easily receive by the time he is 18 the necessary training to enable him to understand their technical applications in the medical sciences proper. Such technical applications are not required, and are not desirable, until the medical sciences are themselves studied.

It is no answer to say that at most schools at the present moment a boy cannot obtain such instruction satisfactorily because the school science teachers have not themselves received the necessary training. It is the duty of the schools (and ultimately of the State) to provide suitable teachers and equipment, and to offer sufficient remuneration to attract first-class men to that as to other branches of the scholastic profession. It is equally the duty of the universities to train such teachers. To assert that it is impossible to train a sufficient number of science teachers to fulfil the functions required of them in the schools is an avowal of impotence in which I for one am not prepared to concur.

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* Obviously these need not be the same in every school. Some schools might particularise in the sciences required for engineering, others for chemical industries, others for medicine, and so on.

I am not dealing with the immediate possibilities of the case, although I am sure that much more could be done, even with these, than some of my scientific colleagues would have us believe. It has, indeed, been abundantly shown that the science instruction given in certain schools is already sufficient to enable boys of 18 not only to pass, but to pass well, such a really stiff examination as the Preliminary Scientific of the University of London. No doubt particular schools have laid themselves out to provide the teachers and equipment required for this purpose; but what can be done by some can be done by others, and the success of the experiment in their case is the best proof of the possibility of giving the proper sort of instruction during the school period. If this is carried out, we at once obtain an invaluable additional year for the study of anatomy and physiology, upon the knowledge of which the whole of medicine and surgery is based, but which are at present in our university practically restricted to a single year—a period quite inadequate for most students to acquire a sound knowledge of subjects so vast in extent and of such fundamental importance.

It is obvious that in a discussion such as we are engaged upon, viz. the improvement of medical education, it is our duty to aim at the ideal. It will help us little to tinker at the present condition of things; the changes which are needed are basic. The education of the country is about to go into the melting-pot, and there will be, it is to be hoped, some chance of adapting the medical curriculum to the introduction of natural science study into schools, which, it seems probable, will be the most prominent feature of any new system of general education.

DISCUSSION.

Professor Harvey Littlejohn.—I have rarely listened to a more enjoyable paper than that of Dr. Haldane. From the strictly practical point of view I do not see that it is possible to give as a part of the ordinary five years' curriculum—the minimum curriculum of our students—the instruction which he aims at in his paper. I do, however, realise that if a student, after he has passed the fundamentals and taken his degree, is going to be a successful practitioner—apart altogether from a successful surgeon or specialist—such further investigation on the lines suggested by Dr. Haldane would make him a much better man, whatever he intended his work to be. I fully agree that for our hospital physicians and surgeons it would be an inestimable advantage to devote their earlier years after graduation to such work as he has indicated, which is really one of the fundamentals in diagnosis and treatment. It is not, however, practicable to carry out a great deal of what he has indicated as useful in our ordinary teaching of the student.

In regard to hospital physicians devoting their whole time to hospital work, I scarcely think it is practicable, nor perhaps, in the majority of cases, advisable.

Dr. Haldane.—I only meant those professors who lecture systematically; not the physicians and surgeons.

Professor Littlejohn.—Provided we had a Professor of Medicine who had already acquired the experience that would enable him to be a thoroughly good physician and teacher at the bedside, it might be an advantage that he should devote his whole time to teaching.

In connection with what Professor Schäfer has said, I know that he has always been engaged too much systematically, and I am sure he has the hearty support of all of us who have for years been giving systematic lectures. We would like to get rid of them to a large extent, and I would be pleased if I could leave the student to get up the subject by himself from text-books, but so far as my subject is concerned, it is impossible that he could get it up from one text-book. The advantage of the systematic lecture is that, without presuming to teach the student everything he ought to know, we indicate the more important subjects. It would be difficult for the students if we left them to grope alone in the larger text-books. It would, however, be a good thing to leave the student more to his own devices, merely pointing out the way to him, but making him use his own powers of observation to get there.

The preliminary education of the student is a debatable matter. I would agree with Professor Schäfer if we had a guarantee that the students would not be allowed to commence medicine before they were 18. I do not think it is possible before that age to obtain at school a sufficient knowledge of those preliminary scientific subjects for the study of medicine. In Scotland we get our students much younger than in England—at 16 or 17—and it would be quite impossible to trust to the teaching that they have got at school in chemistry and physics, botany and biology, to carry them effectively through their further courses in medicine. And we must remember that if we are going to burden the schools with teaching scholars the preliminary scientific subjects, we are doing it at the expense of that general culture without which no man becomes a successful doctor. It is the duty of the university not only to teach the elements of medicine, but to try and make the students men of sympathy, with a knowledge of humanity and a personal and kindly interest in their patients. These attributes play a very great part in making a man not only a successful but a good practitioner.

Dr. Byrom Bramwell.—Regarding the preliminary subjects, many of us agree with the view of Professor Schäfer that botany, natural history, and physics at all events, and perhaps also chemistry, should be passed before the student tackles the study of medicine; I do not think that the argument brought forward by the Dean at all negatives this view. If a boy knew that he had to pass a certain standard in these subjects before he came to medicine he would probably not come up to the university until the age of 18. It would be an enormous advantage if we had these subjects settled with before the student comes to his life-work of medicine. If they were properly taught in the schools, the boys would get quite as much knowledge of botany, natural history, and physics as they do now—quite as much as is necessary for the medical curriculum.

I have been interested in the subject of systematic lectures for many years. I published in the *Edinburgh Medical Journal* of May 1909 practically the same views as those advocated by Professor Schäfer to-night. Twenty years ago I gave a lecture in the course of practice of medicine dealing with the subject of systematic lectures and examinations, etc., and ever since I have given to the students a reprint of that lecture that they might see what they were expected to do and to know. In this school too much importance is placed on systematic lectures. Medicine ought to be studied in the hospital rather than in the lecture-room, and the two courses ought, if possible, to be combined and carried on together. The ordinary course of systematic lectures is often misplaced and wasted. If you had a perfect lecturer in each subject, systematic lectures would be more valuable than the mere text-book. Often the student misses all sense of proportion in a text-book ; he does not know what is important and what is not. A systematic lecturer can emphasise each point as it comes up and drive it home into the student's mind. Nobody can get away from the fact that anatomy, physiology, pathology, and pharmacology are the preliminaries which are essential, and if the lecturers on these subjects would only emphasise the things which are important for medicine, matters would be very much simplified. But in some courses the student gets a hundred lectures, and then comes to the wards knowing a great deal about physiological matters that are of no importance, and very little about others which are vitally important. It is difficult to teach these subjects as they have to be taught in Edinburgh at present, because the large majority of the men want to be practical doctors only. A certain number want a higher course of instruction, and of course the able physiologist, pathologist, etc., wants to go into all the details of his own subject and give the best possible course of lectures. I think it ought to be possible to contrive a course by which a certain number of lectures per week are given to the average man, to teach him what is practically necessary and nothing more, and then fill in, say, other two days in the week with higher lectures, which the average man might attend or not as he liked. Dr. Haldane's more elaborate method of teaching certain subjects would, I think, come in better as a post-graduate course.

I agree with him on the great importance of having a laboratory with a paid skilled assistant to work in connection with the physicians and surgeons of the hospital and to carry out their researches.

The question of having a Professor of Systematic Medicine without practice is an exceedingly debatable one. There are advantages, no doubt, on both sides, and I would not be prepared off-hand to say which is the better plan.

I cordially agree with Dr. Haldane in what he says touching the *vis medicatrix.* That there is a *vis medicatrix* everybody understands, but I do not see that that fact alone can in any way revolutionise the teaching of physiology. Everybody, of course, will agree that sympathy and personal character are of the greatest importance in dealing with disease, the mental attitude of the patient often having a most definite influence on the course of the disease ; but those are things which we *may* be able to teach, but which depend largely on the character of the individual practitioner. Some practitioners have no power of impressing the patient.

Professor Waterston.—Professor Schäfer has told us that practically all the physiology the student wants can be learned from a text-book; but a considerable part of Dr. Haldane's address went to show how unsatisfactory was the presentation of physiology in text-books. In addition to altering the teaching of physiology, Dr. Haldane has almost laid the foundation of a new basis of philosophy. His paper suggests that a certain amount of lecturing is necessary where the philosophical principles upon which the subject is based would be set forth. I, too, think that such lectures are necessary, but to have them, we should need to add at least another year to the medical curriculum, because the very high plane on which Dr. Haldane has treated the subject is, I think, almost beyond the level of apprehension of the average undergraduate in the Scottish school. We must remember that they come to us in Scotland with a less wide general education than they do in England. It may possibly be because the Scots are slower in intellectual development, but they seem to be not quite able—save in exceptional cases—to face up to these very difficult questions.

Dr. Haldane was a little too hard on anatomy, which shares, I have no doubt, the criticisms he expressed on the teaching of physiology. I think there is already the beginning of the new spirit which he has indicated: we have to teach anatomy as a living subject. We shall do so more fully when we get the thing more into our own hands. We shall only be able to carry out some needed reforms when we have a freer hand in the examinations and tests of the students, and when we may judge a man by his work throughout his course rather than by a formal test lasting only an hour or two at the end of it.

Dr. Edwin Bramwell thought it was important to consider the question of the time occupied by physiology in relation to the medical courses. There was, he thought, a general feeling among physicians in this school that physiology occupied too much time in proportion to the rest of the course. We believe that medicine and surgery are the most important subjects to the student, and we cannot help feeling that the time spent on physiology is perhaps unduly great. None of the students who have passed through physiology have anything but admiration for the instruction there, but they always say they have learned so much the application of which they cannot see. The result is that they lose all this when they come to us. Another of the students' criticisms is that, interesting though they have found the physiology course, they would rather spend more time over the subject that is going to be their life-work.

Regarding preliminary education. Professor Schäfer has advocated that the preliminary scientific subjects should be taught before the student comes to the university. If, however, he is to specialise at the rather early age suggested by Professor Schäfer, we are met with the great difficulty that we do not know what the boy's capabilities are. It seems to me that it would be very useful if boys after leaving school could only be placed for six months with someone—a very skilled individual—who could study their qualities and mental characteristics, and come to some sort of conclusion as to what line of life would be best suited to them. So many men seem to have missed their vocation

Dr. Ker.—The most profound remark we have heard this evening is that of Professor Schäfer on trying to put a quart into a pint pot. That came out when we were discussing anatomy. Some people appealed to the anatomist to cut down his subject and leave out some of the detail. The anatomist answered No to this, saying that the tiniest detail was often the most important. We can hardly expect to be any luckier with the physiologist. I was struck a fortnight ago with the words of the Professor of Anatomy when he said that the man who came back to him to prepare for his Final knew practically no anatomy. We know that that is not the fault of bad teaching; but what is the good of a great deal of the anatomy we learn? Are we not trying to overload the human brain? We would probably turn out more efficient practitioners if we asked them to learn a little less. I have been talking to some of the students lately, and, as far as I can make out, the modern student, in spite of his admiration for the physiology course, finds the experimental course largely a waste of time spent in collecting records which many of the collectors will tell you are faked. Would it not be better for the men to see these things done by really competent experts, instead of doing them badly for themselves? Another criticism of the students is that they are asked to get up for examination purposes a series of instruments which are out of date. Another point in my conversations with students that has rather interested me applies to the question of the length of the medical curriculum. I think we all agree with Professor Schäfer that it would be a good thing to get in the extra year. Whether we would all want to give it to physiology I am not quite sure. We might share it, perhaps. But I heard, to my great astonishment, that very few students take advantage of that final year course of surgical anatomy. It was thought that there would be a run on it, but the students have so many classes that through sheer mental fatigue they do not attend this non-compulsory one.

Dr. J. H. Ashworth.—The proposal of Sir Edward Schäfer that the medical student should be taught zoology in school and not in the university is a change which, in my opinion, would react seriously against the interest of the student. The "atmosphere" of zoology as taught in a school would be entirely different from that found in the university. In the university department of zoology there are three or more teachers who give their whole time to the subject and keep in close touch with the recent work in their several branches. They have constant opportunities for the interchange of new ideas, so that whoever is in charge of the teaching to medical students is able to present the subject with a thoroughness, freshness, and breadth of view which could not be maintained by a single teacher in a school. This argument applies with still greater force in the case of universities like our own, where two teachers share the lecture work, so that the student has the benefit of the special knowledge of both. There is the further advantage that in the university the teachers of zoology are in intimate contact with those of the later subjects.

If in order to teach the preliminary sciences in school it is necessary, as suggested, to lengthen the school period by a year, there would be no gain in time to the student, who would profit more by spending that year under the better conditions obtaining in the university. This does not imply that natural history or elementary biology should not be taught in schools; such teaching well done, together with encouragement to make observations on living animals in their natural surroundings, would be valuable and helpful. But the teaching of zoology to medical students, as I understand the method of treatment, is an entirely different matter, and should be retained in the university.

Dr. Dingwall Fordyce.—We have come to the time when it is necessary to think of lengthening the curriculum. This extra time will be claimed by the anatomists and physiologists or by the clinicians. I think we must define our terms, and find out what we mean by physiology and by medicine, and, on the other hand, where anatomy stops and surgery begins. Or, rather, what we want to define is where the teaching of physiology by the physiologist should cease and where the teaching of the clinician should begin. It seems to me that the teaching of the physiologist ought to be conducted in the sphere of the ward, that the teaching of the pathologist should be continued in the post-mortem room of the hospital, and that we ought to co-ordinate the two—physiology should stand side by side with clinical work.

Dr. Taylor.—I should like just to say a word or two about preliminary education once more, because, like all the rest of us, I too was at school once, and, unlike probably most of us here, I was an Arts student from an English school in a Scottish University. I think there is something to be said for Professor Waterston's statement that—in the Arts Faculty at any rate—the English boys knew more literature and were generally better educated than the Scots boys. In my day, for instance, the Professor of Moral Philosophy nearly always found that the essays which stood out from the others were written by the English boys; they were better in style and structure than those of the Scots boys, though the matter presented by the latter was possibly deeper and more carefully thought out. As regards the preliminary scientific education, there seems to be a good deal of misapprehension. It would be quite possible to teach boys science and still to turn them out as efficient in English or other human studies as they are at present, or even more so. I know for a fact that in many Scottish schools the boys are turned out knowing quite as much physics—and knowing it better—as they get at the university, and almost as much chemistry. And the reason is this: in school they have time to assimilate the ideas put before them, and to grow into the subject in a way which they cannot for lack of time do at the university. I speak from experience as an examiner for the Leaving Certificates under the Scotch Education Department when I say that the present standard of chemistry and physics in the schools is almost sufficient, if not quite sufficient, to enable a boy of average intelligence to follow the principles of the application of chemistry and physics to the other subjects of the medical curriculum. It would be a tremendous advantage if these subjects could be finished with at school, leaving the full five years of the curriculum to be devoted to the later subjects.

Dr. Rainy.—There are two ideals in university teaching—the ideal that it should be limited to normal school teaching to train men for medicine, and the ideal that there is something beyond that, viz. to give men a vision beyond the mere qualification for their subsequent life-work. For each of these ideals a different line of teaching would have to be pursued. A great deal might be done in adapting our present course so that it would become not too difficult for the man who is going in for the profession simply as a means of livelihood and whose work will be such that he will be unable to do much laboratory research later on, but stimulating the better man at the same time to higher things. The point that interests me is, how far, maintaining the scientific outlook of physiology and pathology, the curriculum can be so moulded as to give the men the right ideas along lines that will be in touch with their work ?

As regards the position of academic teaching of the first year sciences and school teaching, there is no doubt that a great many more facts can be got up by boys at school than later on, but when you come to the general principles, I do not think the schoolboy of 16 or 17 has quite reached the development of mind that delights in their application. Still, if those detailed facts were got up at school, it would enable the university teaching to be put on a higher plane than it at present occupies.

DR. TRAQUAIR.—I am inclined to regard physiology as in a sense the preparation for the business of observation and inference which comes so largely into medicine, more perhaps than the other preliminary sciences. One notices so often in our students a deficient power of observation, which makes one rather inclined to disagree with the suggestion that observations and experiments should not be done by the students themselves, but should be done for them. Perhaps it is really the work of the clinician to teach the student how to observe and infer, but, after all, this training in observation is *begun* in the physiology class, and this is one reason why it might be well to replace systematic lectures by exercises in observation and inference.

DR. CHALMERS WATSON, after expressing general agreement with the speakers who introduced the subject, illustrated some of the defects in the systematic teaching of physiology from experiences he had had in hospital cliniques, where the students had failed to apply their knowledge of physiology to clinical problems. With regard to such subjects as respiration, the action of the diaphragm, and intestinal stasis, he thought that physiological teaching might be improved with benefit to the clinician. He also suggested that from time to time the clinicians might have the advantage of lectures from distinguished physiologists on the problems of physiology bearing on clinical work.

MR. WILKIE.—We will all agree that in the medical course—whether five or six years—the student will only learn a very little that is of immediate practical value to him at the end of it, and that after graduating he has still a great deal of medicine and surgery to learn ; so that all we can hope to produce is a graduate who has been trained to observe a little what he will see in after years. In the teaching of physiology the practical and experimental part should play a large *rôle*, and that any lectures given should deal with general principles and lead the student to think out problems for himself. It is of great importance that physiology should not be isolated in a department of the university apart from the hospital, but that physiological study and experiments should be conducted in the wards of the hospital.

PROFESSOR LORRAIN SMITH.—The club, I think, is in unanimous agreement with the idea of the substitution of systematic lectures by practical work. It is also practically unanimous in its desire to bring the teaching of physiology more directly into relation with the actual work of the hospital.

I did not gather quite clearly from Dr. Haldane's suggestion of laboratories in connection with the wards how far he would bring that in, not only as a means of investigating disease, but as a means of teaching the application of physiology to clinical problems.

I would like to ask Sir Edward Schäfer to what extent he thinks it would be possible to replace systematic lectures by practical work. This replacement will probably have to be considered in all subjects. No doubt it will be difficult to find a text-book which exactly fits the course of study that each individual teacher wants his students to follow, but if we agree that systematic lectures are to be given up to a large extent, the school will have to prepare a series of text-books which shall be adapted to its teaching.

Referring to the point that boys should have their scientific education in the preliminary subjects before they come to the university, it seems to me to mean this: they would spend another year at school, coming up to the university at 18 instead of 17. I do not quite see where the advantage comes in. That year has to be spent on scientific subjects, and would it not be better spent in the atmosphere of the medical school?

With reference to the question of having research assistants in the hospital, I think this would be a good course, enabling us to introduce not only physiology, but anatomy, pharmacology, and pathology into the clinical teaching, and it would probably solve the problem of making the education of the student more continued than it is at present.

Dr. Haldane said in reply.—This has been to me a most illuminating discussion. Sir Edward Schäfer and the speakers who have followed him have covered points which have so greatly interested me that I have almost forgotten about my own paper! I wish to express my general agreement with what Sir Edward Schäfer has said, and with most of what the other speakers have contributed, and I will simply try to reply to some of the queries which have been raised as regards my own contribution.

I was sorry to find that I had given the impression that such changes in teaching as were proposed in my paper would lengthen the curriculum or make its standard a harder one for the student or teacher. The effect would, I think, be in quite the opposite direction. The structure and activities of a living organism hang together in organic unity, and there ought to be corresponding organic unity in the study and description of them. The phenomena of respiration, for example, are only intelligible in connection with those of nutrition, muscular activity, the blood and circulation, the activity of the liver and kidneys, the nervous system, and other organs. When we keep in view this organic connection, the necessary details are easily remembered; and, on the other hand, it is easy to omit masses of facts which are, in reality, relatively unessential, or which, in the present state of knowledge, cannot be properly interpreted, and therefore cannot be made use of. We want to impart knowledge that can be made use of, not useless unconnected facts. To my mind we could with advantage shorten, not only the systematic lecturing, but also the systematic practical instruction in physiology.

It is quality rather than quantity that students need from their teachers, and that the best teachers are anxious to give, and would often give much more effectively, but for the trammels imposed on them by uninstructed public opinion. I think that systematic lectures are very valuable if given by a teacher who puts his brains and soul into them, and is not compelled to give so many lectures that this is impossible. Looking back at my university career in Edinburgh, I have a very vivid impression of the influence brought to bear on me by lectures.

Clinical laboratories would simply carry forward into practical application the scientific training in the preliminary sciences, and would be used just as much for teaching and demonstration purposes as for original investigation. But I picture these laboratories as being more or less specialised in what each physician or surgeon is specially interested in, and I well know the kind of work I should myself wish to be doing. As a matter of fact, I am helping in doing some of it just now at the Canadian Hospital, Taplow, where Colonel Meakins, a distinguished medical teacher of M'Gill University, is in charge of the medical wards. We have got together a small clinical laboratory there, with apparatus for various special purposes, and are at present studying closely the nature and treatment of a large class of respiratory troubles in connection with gas poisoning, "disordered action of the heart," "shell shock," etc. In order to study these cases we have a bicycle ergometer for graduated exercise; mouthpieces, tubes, valves, bags, and gas-meters to measure the expired air; gas analysis apparatus to analyse it; and other special apparatus to record it quantitatively. We can thus analyse the enormous differences between the respiratory reactions of the patients and those of normal individuals; refer the abnormality to its real causes; devise suitable treatment; and follow up its results. Anatomy, physiology, pathology, and pharmacology are all applied and carried forward in this work. Thus we have to take into account the anatomical arrangement, so laboriously worked out by Miller, by which air is distributed to the lung alveoli. The whole of the new physiological knowledge of the last few years as to the regulation of breathing and circulation, the blood gases, etc., is also involved, along with the pathology of oxygen want and the pharmacology of oxygen administration.

The preliminary sciences, properly understood and taught, place at the disposal of practical medicine an engine of tremendous power. This engine has hardly begun to be made proper use of in this country; and we shall inevitably fall far behind unless we speedily set our minds to the task of using it. In my paper I emphasised what seem to be grave defects in the teaching of the preliminary sciences. But it also seems to me that the defects in the teaching of clinical medicine are perhaps still more grave; and I should like to take this opportunity of saying that I am in full agreement with Sir James Mackenzie in the sweeping criticisms contained in his paper, which I had not seen when I wrote mine. Contact with clinical medicine during the war has very deeply impressed these defects upon me.

In conclusion, let me say how great a personal pleasure it is to me to be back again in the midst of my old medical school, and to realise from the existence of the present inquiry, and the vigour with which it is being conducted, that this school means to keep the position it has won in the forefront of medical progress.

SIR EDWARD SCHÄFER said in reply.—If I were to enter into details in reply to those of my friends who have criticised or put interrogatories to me to-night I should detain you at least as many hours as you have already sat here. The discussion has indeed ranged from phonetics and the decimal system to the higher aspects of philosophy and the mathematics. I am, however, not prepared to go into any side questions, but there are one or two points in the main question which may perhaps be touched upon with advantage.

I wish, in the first place, to refer to Dr. Haldane's excellent address. He has suggested that it had been lost sight of. I beg to assure him that I have not lost sight of it, nor shall I easily forget the eloquence with which he has expounded his views. But I am bound to say that I do not understand some of his statements. For example, he told us that the organic regulation of the organism is neglected by physiologists, both in their text-books and in their oral expositions. I cannot conceive how such a statement can be made. If there is one thing that most teachers deal with at inordinate length it is the regulation of organic processes (by the nervous system, by internal secretion, and so on); insomuch that the student must get completely wearied by the iteration.

Dr. Ker has, it seems, gone to his students for their opinion as to the value of the instruction they receive. But a student is not always the best authority as to the value of methods of instruction. He can rarely appreciate the fact that the object of what I have called "observational courses" is to cultivate the faculty of observation. Some persons can never be taught to observe. They may become successful practitioners if they have a good bedside manner—which I suppose is still important—but the men who are making a name at the present day are those who have carried the faculty of observation right through their career. They are, you may be sure, men who did not leave their physiology behind them after the second year, but took it on with them to all their later subjects, and brought it to bear upon their practice. Every clinician ought to be a physiologist. He cannot be a good clinician without being a physiologist. He cannot talk about the disorders of the heart or the nervous system without knowing about their physiology. We physiologists can only put before the students the general principles of our science; we have no time for the details, although we endeavour to illustrate the general principles by concrete examples. We consider it of the highest importance to train the students in methods of observation. It is idle to say that they learn nothing from the study of the movements of the muscles of the frog or of the nervous system of the frog. These act in exactly the same way as those of man, and the students can learn the methods of observation in the one case as well as in the other.

Dr. Traquair asked how much the students study physiology on man himself. The answer is: "In every possible way." Working in pairs, they are expected to make observations upon one another in regard to the special senses, the circulation (pulse, heart, etc.), the respiration, reactions of the nervous system, and so on.

I am not prepared to accept Dr. Chalmers Watson's invitation to give you an account of what is known regarding the movements of the stomach and intestine. I will be satisfied with saying that the subject occupies an important position in the course of physiology, since it is one just now in special prominence, and I expect that many of you clinicians know a great deal more about it than I can pretend to.

I agree with Dr. Dingwall Fordyce that the teaching of physiology should never cease. Anyone who has the faculty of observation will go on adding to his stock of physiology all the time. It is the business of clinicians to continue the teaching of physiology in the later part of the student's course.

On many questions, *e.g.* that of the electrical conditions of the heart in health and disease, the clinicians know more than many a physiologist. The clinician must not only be able to deal with normal physiology; he should show the student how it is altered by the particular clinical condition under consideration.

With reference to Dr. Ashworth's expression of opinion, I have only to say that, although what he says is undoubtedly applicable to the higher teaching in his subject, it does not, in my judgment, affect the question of elementary instruction.

Many of the criticisms made to-night are answered by anticipation in my papers. The idea that the last years of the boy at school is to be devoted to science alone was in no way a suggestion of mine. I should let him go on with his general education, but, instead of specialising in Latin and Greek, he would, during his later years, specialise in the sciences which he will require later on in his future career.

As to examinations, my views on this question are strong; but we cannot get rid of examinations altogether. I think, though, that a great deal might be done by substituting records of work. At present, for the degree examinations, we allow nothing even for the most complete records of practical work done. That this work is faked, as Dr. Ker suggested, is quite impossible—at any rate in physiology—for we have means of ascertaining whether tracings and records are faked, and, be sure, we mark them accordingly!

In reply to Professor Lorrain Smith's question as to how one would replace lectures by observational work, I think a clinical lecture is as apt an illustration as I can select to point the moral which I desire to enforce. The way in which a good clinical lecturer will go over a case before him, illustrating one point after another by that case, and allowing his students to hear and see everything for themselves, is exactly what is wanted in all subjects. And I believe that more would be gained by the general adoption of such practical methods of teaching than by the compulsory attendance of the student at any number of systematic lectures.

XI.—PATHOLOGY AND THE MEDICAL STUDENT.

By HENRY R. DEAN, Professor of Pathology, University of Manchester.

To the pathologist all things, at any rate all medical things, are pathology. The pathologist, if he thinks as I would have him think, must hold his subject to be the centre of all medical science and look on all others as grouped around it. Chemistry, physics, physiology, and anatomy interest him in so far as they supply the keys to problems which he has to face. Medicine, surgery, and gynecology represent to him branches of applied pathology—pathology applied to the treatment of disease on various specialised lines. All medical men are students of pathology, pure or applied, and without pathology no branch of medical science is complete. The complete pathologist must possess all medical knowledge, and obviously the complete pathologist does not exist. But, at any rate, the pathologist can say, "I am a pathologist I reckon nothing which appertains to disease without interest to me." Now, these views are extreme views, the views of one who looks on his subject with enthusiasm, and who, perhaps, can hardly expect his colleagues to share his point of view. Nevertheless, I hold that views like these are necessary to any man whose business it is to teach pathology to medical students. Pathology is not a preliminary subject, the greater part of which may be subsequently forgotten, which serves a useful purpose in exercising and preparing the mind of the student who is about to proceed to the more serious matters dealt with in the final examination. It is not a special department of medicine, a series of elaborate and out-of-the-way methods of investigation, a sort of witchcraft practised by eccentric individuals in a laboratory, useful enough as an aid to diagnosis in certain diseases, but unessential, if not out of place, in the equipment of the practical man. Nor is pathology an independent science—such as some would make physiology—a specialised department of biology standing proudly aloof from the crafts of medicine and surgery. To my mind pathology and medicine form one whole, and it is as difficult to think of pathology without medicine as I trust it is impossible to think of medicine without pathology. The student of medicine must be first and last a student of pathology. He learns the elements of chemistry and of physics, he studies the structure and functions of the healthy body, and then reaches what is to be his life's work—the study of disease.

It is in something of this spirit that I would have the student begin his studies in pathology: I should like him to feel, not that he is commencing another preliminary subject, but that he is at last beginning the study of disease—that he is laying a foundation of a knowledge of medicine. Medicine, surgery, gynecology, and pathology form one indivisible whole, and the component parts of this one science cannot be learned separately and piecemeal, for just as a knowledge of medicine must be based in part on the experience of the post-mortem room, so is a knowledge of pathology incomplete without the study of the manifestations of disease in living patients in the ward; for each disease is a process, a series of changes of which our conception is limited indeed if we confine ourselves to the picture of the final stage as seen in the post-mortem room.

The student, when he percusses the dull area in a case of lobar pneumonia, when he listens to the tubular breathing, should think of the anatomical and histological alterations which have produced these physical signs, of the progress and changes which these lesions may undergo, and so of the physical signs which subsequent changes may be expected to produce. The clinical picture of pneumonia should instinctively suggest the bacteriological aspect and possibilities of the disease, the microscopical appearance and habits of the pneumococcus, the organs which it may attack and the lesions which it may produce. In the same way a demonstration on a tuberculous lung in the post-mortem room should be the occasion for reflection on the signs by which the cavity, the areas of caseation, and the compensatory emphysema would have manifested their presence during the patient's life. In this way the quite artificial barrier which many a student builds up between pathology and medicine is broken down, and experience gained in the study of disease by the methods practised by the pathologist amplifies and increases experience gained in the wards, so that the student's knowledge of disease becomes an undivided whole.

In practice the teaching of pathology falls into two sections—General or Pure Pathology, and Special or Applied Pathology. General pathology forms the essential introduction not only to special pathology, but to every department of medicine and surgery. It must obviously be commenced immediately after the examination in anatomy and physiology has been passed. The general principles which underlie the degenerations, inflammation, and immunity form the logical sequel of the course in normal physiology, and should be mastered readily enough by a third-year student. The great general processes which play so vast a part in all diseases form the student's introduction to medicine and surgery. General pathology is intelligible to the student who as yet is unfamiliar with clinical work in the wards of the hospital.

It is very different with special or applied pathology. Here we have to deal with changes which occur in certain organs and in particular diseases. Here it is that co-ordination between the ward, the post-mortem room, and the laboratory becomes essential, for special pathology, medicine, and surgery form one subject. I may perhaps illustrate my meaning by an example. The anatomical and histological changes which constitute the picture of a contracted granular kidney are nothing more or less than fibrosis of the kidney, chronic interstitial inflammation. It is only necessary to apply to the kidney the general principles of chronic inflammation, and all, or nearly all, has been said which appertains to morbid anatomy in the narrower sense. But when we go on, as we always do, to a consideration of the changes in other organs—in the heart and the vessels—to the changes produced in the circulation, to the alterations in the urine and the effects of damage to the excretory mechanism, we are painting a picture not merely of the special pathology of the kidney, but of the sequence of co-ordinated changes which may occur in a living human being and form the essential features of a definite disease. Here, and in almost every other disease, the subject which we call pathology interlocks with that which we call medicine, and it must be so, for the two constitute one whole. Now, however well the pathologist may paint his picture, however well he may be equipped with museum jars and paraffin sections to illustrate the co-ordination of lesions in various organs, it is very hard for a student to understand a disease like chronic interstitial nephritis unless he has studied cases of this disease in the wards of a hospital. The more close the co-ordination in the teaching of special pathology and medicine, the more rapid will be the progress of the student in each. The study of disease in the wards helps the student with his laboratory work just as the learning of medicine or surgery is rendered easier by an understanding of pathology.

This brings us to the important point of the period of time over which the teaching of pathology should extend. While the study of elementary general pathology demands little or no clinical experience, it is, in my opinion, impossible to expect an understanding of special or applied pathology in students who have at the best a most elementary knowledge of medicine and surgery. The pathology course at many medical schools is limited to the three terms (or twelve months) immediately following the examination in anatomy and physiology. This is the time when the student begins his work in the wards and out-patient departments, and the entry into clinical work marks an epoch in the student's career. The orderly courses of the laboratory are exchanged for the casual instruction of the ward. In hospital work a much greater call is made on the individual student's initiative, and his progress depends to a far greater extent on his capacity for teaching himself and seeking out the opportunity for study. Moreover, the novelty of hospital life, with its opportunities for contact with real patients, and with its numerous adventitious interests, makes an appeal to the student mind which tends to make the rather more familiar routine of work in the pathological laboratory by comparison dull and unattractive. The average student takes a little time to settle down to hospital life, and during this period work suffers. During this period, too, there may be courses in pharmacology and hygiene which must be attended. If we examine the three terms which follow the examination in anatomy and physiology, we find that it is one of the most crowded periods of the course. During these three terms only a limited amount of time—seven to ten hours a week, perhaps—can be spared for pathology, and it is obvious that, with the numerous claims which hospital work makes on his attention, the student can spare but a limited number of hours to the private study of pathology. In my opinion, this fraction of the student's time during the first three terms of hospital work is absolutely inadequate for the study of a subject which should form the keystone of medical science. In practice it is quite impossible to cover the ground in the time. But there are other equally urgent reasons for prolonging the period of the course. Special pathology, from the student's standpoint, is an applied science, and is of importance to him in its relation to medicine and surgery. It is impossible to make the pathology and bacteriology of typhoid fever interesting or even intelligible to a student who has never seen a case of the disease. Typhoid fever is a process, a series of changes affecting every part of the body. The museum jars and the stained sections represent a few important incidents carefully preserved for exact study. Practical experience with actual cases of the disease supplies the missing links of the chain, and the pathological preparations become objects of genuine interest to the student, as they elaborate and explain certain phases of a general process already familiar to him in outline. Is it reasonable to expect an understanding of the pathology of syphilis in a student who has never seen a chancre or a case of general paralysis of the insane? What interest can the student take in the histological differences between a scirrhus and a fibro-adenoma of the breast until he has seen cases illustrating these conditions in the wards and on the operating table? Pathology, if it is to be the useful reality which it ought to be to the student and the graduate, must be learnt in the wards as well as in the post-mortem room and the laboratory. Pathology does not begin when the patient dies. Medicine, surgery, and special pathology form one whole and should be learnt as one subject. If this view is sound, it follows that the examination in pathology comes in some universities far too soon in the course. It is taken before the student has had time or opportunity to discover what pathology is. The course is brought to a close just at the time when the student should be beginning to appreciate its value and understand its intimate relation to the sister arts of diagnosis and treatment. Instruction in pathology should, in my opinion, extend to the final year of the medical course, and the examination should be taken either as part of the final examination or, at the earliest, six months before. I do not think that this would add to the student's burden, for I think that suitable instruction in special or applied pathology would render easier the task of getting up the clinical subjects of the final examination. I hold that an adequate knowledge of special pathology is essential to an understanding of medicine, surgery, and gynecology. If this is true, instruction in special pathology should be given during the final year, at the time when the student needs it and is in a position to appreciate its value. It does not necessarily follow that the hours devoted to teaching in pathology would be greatly increased. My contention is, that the period during which pathology is studied should be lengthened. Medicine, surgery, gynecology, and pathology form one subject, and should be studied during the same period, and allowed to form one undivided whole.

A SUGGESTION FOR A SCHEME OF TEACHING.—Having dealt with the scope and objects of the teaching of pathology, I pass to ways and means, and venture to submit for your consideration the following scheme:—

The entire course is designed to extend over a period of six terms—two academic years—and is arranged to avoid duplication of classes. The first term is devoted to general pathology. The second and third terms are devoted to the special pathology of the blood, the heart and blood-vessels, the respiratory organs, and the alimentary system. During the fourth term of the course there is no systematic instruction in pathology. This term, however, is utilised for the course in general pathology for the students of the following year. In the fifth and six terms the lectures and classes in special pathology are continued, and instruction is given in the diseases of the genito-urinary system, the ductless glands, the central nervous system, and the bones and joints. The students of each year join the special pathology class as soon as they have completed the annual course in general pathology. That is to say, the course in special pathology would be attended by the students of two successive years, and the students of each alternate year would begin the course in special pathology with either the diseases of the blood or the diseases of the genito-urinary system.

GENERAL PATHOLOGY.—This class would form the introduction to the course in pathology, and would extend over one term. The subjects dealt with would be the elementary principles and practice of bacteriology, the degenerations, inflammation, and the facts and fancies which we are in the habit of grouping under the heading of Immunity. The course would also include the general pathology of tuberculosis and syphilis, and the characters of the more important tumours. The period of time, one term, may appear short, but I propose to compensate for this by giving, during this term, a liberal allowance of hours to pathology. The number of lectures and hours of work for laboratory classes it would serve no useful purpose to discuss, for these details must rest with the inclination and discretion of the lecturer. I should personally prefer that the class met for a whole day's work on two consecutive days in each week. There would be great advantages in a continuous class from the morning to afternoon, as unfamiliar methods require practice, and the necessary dexterity is often not acquired in the three hours commonly allowed for a practical class. If the class is held on consecutive days the number of methods and experiments which can be practised is considerably increased.

I am, on the whole, inclined to think that the practical course should begin with elementary bacteriology, the general methods of making microscopical preparations of micro-organisms and of separating pure cultures. The general principles of sterilisation by heat and the preparation of culture media should be demonstrated. If time allowed, culture media might be prepared by the class. During this period every effort would be made to demonstrate the methods employed for the collection of material for bacteriological investigation. The students would be encouraged to become familiar with the use of ordinary apparatus, such as the centrifuge and the autoclave, and would be taught to make and use simple accessories, such as spreaders and capillary pipettes. This plan would, I am sure, require more laboratory space than is usually available, but I do not think that either the time or the space would be wasted, for, in my opinion, laboratory courses tend to become too set and formal, and the preparations for the class are often so elaborate that nothing is left which can develop in the student either resourcefulness or dexterity. The general principles of bacteriology would be illustrated by practical work with the staphylococci, streptococci, and B. coli. The tubercle bacillus might be studied at this point, since it is desirable that the student should learn at the earliest possible moment the methods employed for its recognition, and some practice might be allowed in anaerobic methods. The consideration of other varieties of bacteria I should postpone until the student reached the part of the course devoted to special pathology, for, from the point of view of the medical student, bacteriology is not a separate subject, but a part of pathology. A pathogenic bacillus is of importance to the medical student because of the pathological changes and lesions which it produces. The bacillus itself and its cultural properties are of interest in so far as a knowledge of them can be used for diagnostic purposes, or explain the methods by which disease may be cured or its spread prevented. To lecture on the typhoid bacillus in May and on the changes produced by it in the intestine in November is wanton mutilation. The pathology and bacteriology of typhoid fever form one subject, and should be dealt with at the same period of the course.

After a few elementary lessons in bacteriology the degenerative processes would be studied. This part of the course is an opportunity for introducing practical work in pathological chemistry, if it is thought that the necessary time can be spared. Of the teaching of inflammation I have nothing to say, except that some printed accounts of the subject seem to be extraordinarily elaborate, and the student is rather apt to overlook the essential features in a desperate effort to distinguish between clasmatocytes and polyblasts. Obscure details of this type are, it seems to me, quite out of place in a course for medical students, for whom broad principles and general processes are the first essential, and details only important when they supply the key to the pathology of some particular disease. It is nevertheless true that the long words and obscure passages in a text-book do exercise an extraordinary fascination for the mind of the student.

After or with inflammation comes immunity. The formation of antibodies is just as much the reaction to injury as are the phenomena of inflammation, and the two subjects may profitably be studied together. The teaching of immunity should be based on observations made by the student himself in the class-room. In this part of the subject practical experiments of a simple type are easy for the teacher to arrange and easy for the student to perform. With a little trouble exercises can be set which enable the student to demonstrate to himself the majority of the essential facts, and the necessity for the use of the elaborate symbols, introduced by Ehrlich, is largely obviated. After dealing with fibrosis and repair, tuberculosis and syphilis would be discussed, and the general course would conclude with the pathology of tumours treated in an elementary fashion. I look on the course in general pathology as an introduction to pathology and medicine. In it the student should learn not merely general principles but also the general methods of pathological investigation. The occurrence of pathological material in a hospital is, of necessity, fortuitous, and at the end of the course in general pathology the student should be in a position not merely to profit by instruction in any particular case, but to practise the ordinary methods of investigation for himself. The medical student should be taught to teach himself.

SPECIAL PATHOLOGY.—It is, in my opinion, essential that the student should learn as one whole subject the special pathology, medicine, and surgery of each organ and each disease. If this plan is to be followed, the course on special pathology must be allowed to extend over the greater part of the period of clinical study. I have already dealt with this question at some length, and I will here only add that it would be a great advantage if clinical and pathological teaching were so correlated that the lectures on the medicine, surgery, and pathology of any organ could be given in the same week. Co-operation of this intimate kind would certainly be difficult to arrange, and might be found impossible, but if it were possible the results would repay the trouble expended.

The relation between special pathology and medicine, surgery, and gynecology is so intimate that it is obvious that a certain amount of overlapping in the teaching of these subjects must inevitably occur. This overlapping is probably up to a certain point not disadvantageous. Nevertheless it appears to me that a little more might be done in the direction of co-operation between the teachers of various subjects in a medical school. It is seldom, I imagine, that a professor of medicine has any exact idea of the ground covered by his colleague in pathology, and the professor of pathology has as little knowledge of the extent to which pathology is dealt with in the course on systematic surgery. Each teacher within the precincts of his own lecture room defines the limits of his subject precisely as he thinks fit. This is all very well up to a point, and I am sure that we should all resent dictation on the scope and subject-matter of our lectures; but the five years' curriculum is short, and we should all be glad to save time when we could. There are no real frontiers or boundaries between medicine, surgery, and special pathology, and there is certainly much common ground. An occasional round-table conference between the people in a medical school who teach the same class of students might serve a useful purpose, and might save unnecessary repetition. If after such an exchange of views we decided to go our own ways, and to teach on precisely the same lines as before, it would be, all the same, an advantage to know more exactly the lines on which our colleagues taught, the knowledge which we might expect our students to possess, and the kind of instruction which we ought to give to help our students with their work in other departments. There is another way in which the gap between the laboratory and the ward might be bridged, or rather filled up, for there ought to be no gap. Demonstrators in medical, surgical, and gynecological pathology might be appointed. These men, comparatively junior men, would act as demonstrators of pathology in the laboratory, and as demonstrators of medicine, surgery, or gynecology in the wards. One man, for instance, could with advantage hold the posts of demonstrator of pathology and medical registrar. The institution of posts of this kind would do much to stimulate the student's interest in pathology, and, I venture to think, would have no disastrous influence on the teaching of clinical medicine and surgery. Such posts would be, moreover, not without value to their holders.

The business of a department of pathology in a medical school is to teach the sort of pathology which every medical man ought to know. The closer the co-operation between the hospital and the laboratory, the better for the medical student. The reputation of a medical school has often rested on a tradition of methodical and accurate physical examination handed down from some great teacher. The best way to teach pathology is to utilise to the full the material which every hospital affords. The investigation of every case admitted to the wards should be as full and accurate as it is possible to make it, and the laboratory equipment and staff should be on a scale large enough to make this possible. It is not within the scope of this essay to enlarge on the work of hospital laboratories, but it is obvious that accommodation, equipment, and staff should be adequate for the bacteriological, chemical, and histological investigation of the cases in the wards. The student ought to be able to watch and when possible to assist the pathologist in the investigation of patients with whose conditions he is already familiar. If the cases are examined in the way they ought to be, the student will have opportunity enough of learning the sort of pathology which he ought to learn.

In addition to formal lectures and a systematic laboratory course the most should be made of the opportunities which every hospital affords for demonstrations on the pathology of some particular case. A particularly good case in the post-mortem room, a run of one particular type of tumour from the operating theatre, or the presence of cases illustrating the diseases of the blood in the wards, should be utilised to the full for instruction in pathology. Material from cases which the students have seen in the wards has an interest which is absent from the ordinary specimens given out in class. A great part of the student's instruction in pathology should be based on the material which the hospital from time to time provides. It is of course necessary that there should be the closest possible co-operation between the hospital and the pathology department. From the student's point of view such co-operation cannot be too close. I have often thought that the pathological department should contain a room in which a part of a bench could be allotted to every student for the last two years of his course. To such a place the student could remove any material which he wanted to investigate. Such a scheme would involve much space and some expense, and I do not suppose that all students would make use of such an opportunity, but I do believe the number of students who would make use of such a laboratory would not be small, and the advantage it would be to them would more than justify such an experiment.

Clinical Pathology.—I have dealt so far with the kind of pathology which every medical student must know if he is to acquire an intelligent knowledge of medicine and surgery. I come now to what is ordinarily called clinical pathology, by which I understand the laboratory methods of diagnosis which are usually practised by a professional pathologist. How much or how little is the student to be taught of these things? Nobody, of course, desires, and nobody expects, that the course should include such training in these methods that the student would be able to carry out the Wassermann reaction, or make a bacterial vaccine. These things are the province of the specialist in pathology. But the student should learn the sort of case in which the services of a trained pathologist will be required; he ought to know how to collect the necessary specimens; he ought to understand the methods which the pathologist uses, their limitations and sources of error, and he ought to be able to interpret the report which the pathologist sends, and assess at neither too low nor too high a value the evidence obtained by laboratory methods. To do this he must go to the laboratory and watch the investigations which are in progress, and carry out, or attempt to carry out, some at least of these methods for himself. Students should for this purpose be attached for a period of three months to the clinical laboratory in the capacity of student assistants. During such a period the student will see enough of the commoner methods to give an idea of what can and what cannot be done. It will not qualify him to act as a professional pathologist any more than the holding of a post as surgical dresser qualifies him to undertake a difficult surgical operation.

The advances in clinical pathology during the last twenty years have been considerable, and all of us hope that the rate of progress in this sort of work will be at least maintained.

If the general practitioner is to be expected to keep up with the advances which take place during the period of his professional career, we must see to it that his training as a student is on modern lines and that he has a knowledge of the lines on which progress is to be expected in the future.

AN HONOURS COURSE IN PATHOLOGY.—The medical students of a former generation were often men who had graduated in some other faculty and brought to their medical studies a mind trained by experimental work in natural science or by the logic and philosophy of classical literature. Nowadays such students are the exception, and the first-year medical students of to-day are boys of 16 or 17 years, fresh from a secondary school. Education has undergone a speeding-up process, and in the medical curriculum room has had to be found for a steadily increasing number of special courses. The new subjects have been wedged in, here and there, amid the old, and all the courses have been shortened to meet the necessity of completing the curriculum within five years, and during these five years every day is so crowded with lectures, classes, and practical instruction, that the student can have no leisure for an attempt to co-ordinate and put together the varied information which he receives. The medical curriculum is a system of cramming, and insufficient time is allowed for digestion. The time has arrived and, I venture to think, is long overdue, when we should sit down to remodel and recast the entire curriculum, consider what is essential and what is not, and to co-ordinate the teaching in all subjects, so that the whole forms a systematic course in medicine in which the connection and mutual interdependence of the various parts shall be obvious not only to the teacher but to the taught The Universities of Oxford and Cambridge still require candidates for the medical degree to graduate first in the school of Natural Science, and in other universities occasional students take a B.Sc. before proceeding to or completing the medical course. The chief advantages rest, not on the extra knowledge but in the additional experience and broader outlook which the student acquires. Problems are probed more deeply, and there is more time to think. The laboratory becomes something more than a class-room, and he learns something of the methods of research. He discovers the literature of the subject, and finds out that the statements of the text-book are not absolute and not final. He learns the art of teaching himself, the most useful thing that a student can learn. The subject chosen for an extra year of study is usually physiology. I think that the time has now arrived when students who are prepared to devote the necessary extra time might be encouraged to take an Honours course in general and experimental pathology. On passing the examination at the end of the course, the candidates would be entitled to a B.Sc. degree. The material for such a course is ready to hand, and it should not prove difficult to arrange a syllabus. The degenerations, the disorders of the circulation, of metabolism, of the ductless glands, the phenomena of infection, fever, inflammation, and immunity, are all admirable subjects for an Honours class. A carefully arranged experimental course and a wide and judicious study of the literature would constitute a training of enormous value to men about to proceed to scientific medicine. The course could be interpolated quite naturally between the third and fourth or between the fourth and fifth years of the medical curriculum.

It is not every student who can afford the time to take such an extended course in general pathology as I have tried to sketch out. Such an Honours course in pathology would be, I know, something of a luxury, something which I should like to see, which I hope to see carried out. But for the moment we are concerned less with luxuries than with absolute necessities, and, as I think, active teaching in pathology is an absolute necessity in a medical school—not merely the pathology of the post-mortem room and of the museum, not merely the pathology of the laboratories, not merely and exclusively the pathology of the wards, but rather pathology as a whole. This whole pathology, as I understand it, is an active and progressive interest in and knowledge of disease, an instinctive impulse to probe the causes, to study in detail the sequence of changes, to explain the action of preventive and curative measures, and to point the way forward to fresh advances in medical science. Pathology is a general and unspecialised knowledge of disease common to all medical men, graduate and undergraduate alike, general practitioner and consultant.

XII.—ON THE TEACHING OF PATHOLOGICAL ANATOMY, WITH SPECIAL REFERENCE TO CLINICAL MEDICINE.

By Dr. IVY MACKENZIE, Glasgow.

The medical profession, like every other social institution, has its origin and growth in certain human needs. It exists now among races in a primitive form where science is unknown, and the historical basis of modern medicine is traceable to the simple empirical adaptation of means to end in dealing with pains and complaints. There was a rational basis * for the treatment of illness before the days of Morgagni, or of the Hunters, or of Virchow; but with the growth of the biological, physical, and chemical sciences, the centre of interest, especially in research, veered from the phenomena of symptomatology to the underlying anatomical changes associated with various ailments and disabilities. It was gradually recognised that the anatomical basis of disease was of prime importance, not only in classification but also in the interpretation of ailments, and the field of pathology in its various departments is now regarded as the essential basis for the scientific study of medicine. Every other department of the medical curriculum, outside of hospital work, is merely contributory, and clinical work itself loses its value when not associated with an intelligent appreciation of its relation to the principles and practice of pathology. So important a place does pathology now occupy in the medical course that it has become elevated almost into an independent science, and in this way there is for the student a threatened dissociation of pathology from practical medicine, whose interests it ought primarily to subserve.

I have no right to resort to criticism of that department of my own medical school to which I owe so much; that would be an act of disloyalty and ingratitude to a friend and teacher who has devoted his ability and enthusiasm with a perfect singleness of purpose to the interests of the student. If I were to venture any criticism at all it

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* The "rational basis" or theory explaining a series of correlated facts is an afterthought on the part of the observer. The mind naturally seeks to justify its interpretation by explanations, however far-fetched, and the difference between the "medical man" of the primitive race and the cultured physician depends on the fact that the latter is able to base his justifications on a more extensive and more complicated system of knowledge.

would be in the light of the suggestion that in some respects too much is done for the student. Knowing, as I do, the elaborate care with which lectures and demonstrations are prepared, how is it that the young graduate is so disappointing in his appreciation of the pathological processes in a clinical case, and what is the nature of this lack of appreciation? His knowledge of pathology is usually out of all proportion to his capacity to apply that knowledge in clinical observation. That may be largely due to the nature of his clinical teaching, but, broadly speaking, it is due to the fact that pathological anatomy and clinical medicine are taught as independent subjects, and as such they remain in his system of knowledge and experience. Question him on pathology in a pathological context and one is surprised at his knowledge; but question him on pathology in a clinical context and one is appalled at his ignorance. This is the crucial point of his failure, and an explanation affords a clue to possible improvement in the teaching of pathology for practical purposes.

My old teacher, Professor Cleland, used to say, "When all scientists are philosophers, and all philosophers are scientists, it will be a very happy world indeed." It might with equal truth be said that when all pathologists are clinicians and all clinicians are pathologists incalculable progress and wisdom will be the fruit of medical experience.

But useful and constructive criticism must begin with conditions as we know them, and suggestions must be confined within the limits of the possible.

Leaving for the moment the clinicians on one side, how is it that the teaching of pathology could be made more practical and more easily incorporated with the clinical ideas of the student, more obviously vital to him as an essential part of his armamentarium in the struggles of diagnosis and treatment.

Take, for example, the growth of one's own knowledge of pathology in relation to medicine. What are the conditions under which the young pathologist, who has already finished with examinations, approaches the subject on his own account and learns to interpret for himself in a more or less independent manner the relation of structure to disease. He begins not with general pathology, or with the pathology of a system, or with a subject in pathology. He begins, as a rule, with a case. The signs and symptoms of the morbid state of some case have been analysed; it has been followed to post-mortem; the organs are examined. His imagination works on the construction of an explanation which will account for the phenomena on a rational basis. The matter is simple; it is the alphabet of pathology; it is the first lesson in the elements of scientific medicine.

It is, for example, a case of long-standing fever with cardiac disease. The essential features recognised clinically were: (1) Protracted, irregular fever, which did not respond to salicylates, although there was a history of earlier rheumatism. (2) Heart enlargement and valvular murmurs. (3) Increasing weakness and anæmia. (4) Indigestion and dirty tongue. (5) Scanty urine with albumen and blood. (6) Enlargement and tenderness of the liver. (7) Dropsy. (8) Pericarditis late in the course of the disease. (9) Streptococci in the blood.

Post-mortem showed :—

1. Chronic heart disease with recent malignant endocarditis accounting for fever refractory to salicylates.(1)
2. Enlargement and dilatation of the heart. Cicatricial contracture of the mitral and aortic valves. Shaggy, fibrinous deposits on the valves, and small recent ulcers in their area, accounting for cardiac signs.(2)
3. General evidence of sepsis in heart, kidneys (septic infarction), and bone-marrow (red), accounting for increasing weakness and anæmia.(3)
4. Catarrh of stomach, accounting for indigestion.(4)
5. Large, congested kidneys, with hæmorrhage and conspicuous glomeruli, accounting for blood and albumen in the urine.(5)
6. Large, congested liver with distended venules and fat, accounting for large, tender liver and indigestion.(6)
7. Œdema of tissues in the lungs ; fluid in the free somatic cavities ; evidence of failure of peripheral circulation.(7)
8. Pericarditis.(8)
9. Streptococci in cardiac valves.(9)

The process of correlation is simple, and the facts provide a solid basis for the interpretation of the natural history of the disease. Here is a case of chronic cardiac trouble, originating in previous attacks of rheumatism. The natural decline of circulatory efficiency has been interrupted more or less suddenly by weakness, headaches, pains in the joints, and sweatings. Antirheumatic treatment has proved ineffective. Aortic and mitral murmurs are present ; weakness and anæmia increase ; albumen appears in the urine, and later there is blood ; the tongue is dirty, the appetite poor, breathing becomes more difficult ; there is cyanosis of the lips ; anasarca develops, with fluid in the free somatic cavities ; and the liver has become large and tender ; the pulse becomes more rapid ; there is severe pain over the heart, and friction is heard. The blood is examined. Leucocytosis is present, and there is a streptococcal growth. Weakness increases ; the patient dies, and in the light of the post-mortem findings the story is retold.

In the early attacks of rheumatism the aortic valve had become crumpled, and the mitral tendons constricted and shortened. Through a complicated series of local and peripheral adaptations circulation had been maintained in a state of comparatively adequate efficiency till an infective organism gained access, probably from the bowel to the circulatory stream; found a habitat in the weakening cardiac valves, and a medium of proliferation in the blood. The immunising reaction of the organism being too feeble, the process goes in vicious circles succeeding phases being characterised by progressive weakness, rigors, anæmia, indigestion, albuminuria and hæmaturia, dropsy, breathlessness and cardiac pain. The whole story can be elucidated round the central process of progressive infection, and the conclusions of the successive chapters are depicted in the various organic changes at death. (1) The anæmia had arisen from septic poisoning of the blood, the toxins of streptococci and the débris of their inflammatory productions; and the end-result of the anæmia is shown by the abnormal red bone-marrow. (2) The circulatory weakness is accounted for by a mechanical defect in the heart, the irritation and obstruction of precardial exudate and effusion. The breakdown of the peripheral circulation as shown in œdema and defective elimination is explained by the state of the kidneys, and, in addition to all those factors, the circulation is influenced by the anæmia. (3) Indigestion is accounted for by catarrh of the bowel, due to passive hyperæmia, associated with congestive enlargement of the liver, and perversion of the metabolism due to fatty degeneration of the liver through congestion and defective oxidation; and all these factors accompanied by the effects of defective elimination from the kidneys. (4) The scanty and abnormal urine finds its explanation in congested and inflamed kidneys, the congestion arising from enfeebled circulation, and the inflammation from embolic infection of the glomeruli. (5) Rigors are accounted for by the spreading of septic emboli from the cardiac valves, as evidenced in septic infarction of the kidneys and spleen; and the cardiac pain finds its explanation in pericarditis.

Such, in brief outline, is an account of the natural processes of the disease as reconstructed from the anatomical end-results in the light of the history of the ailment.

But why, you may ask, all these details of a simple case? Simply because these are the details of a story in disease which can be followed and understood by the average student who has a moderate knowledge of anatomy and physiology, and a casual acquaintance with the main clinical phenomena of disease. But this, it may be said, is exactly what is done in post-mortem demonstrations. Personally, I have not seen, either in this or in any other country, a sufficient care devoted to the correlation of clinical phenomena with post-mortem findings in the class-room. In the wards, symptoms and physical signs are considered in detail, but without due reference to the underlying anatomical processes. The confirmation of the diagnosis in a restricted sense by post-mortem examination satisfies most clinicians apart from the unravelling of the details of the process of organic dissolution, and the pathologist is seldom provided with that rational account of the development of the disease which would enable or encourage him to make a complete story out of the findings. If proof of this were required, it is to be found in the destination of the organs. Take the imaginary case referred to and it would be found that if the heart were preserved it would be placed in a jar alongside of other hearts of a totally different character, and from cases with which our case had practically nothing in common. In another corner of the museum, or in another room, might be found the kidney with an amyloid kidney on one side of it and a large white kidney on the other—in quite an interesting position for the pathologist already versed in the complicated comparisons between the same organs differently affected—but obviously detached from its nosological context, and more or less useless for the elementary study of disease. The nutmeg liver might be stored in still another corner, meaningless so far as its origin and organic associations were concerned. The time which the unfortunate student, who knows little or nothing about pathology, spends with his text-book or his excellent lectures in the average pathological museum reminds me of the unhappy hours I passed among the Greek verbs.

I think I have heard of a new method of teaching foreign tongues, more in consonance with the evolutionary idea of the growth of speech and language than that in practice some years ago; a method whereby the pupil is first taught to practise the simplest forms of expression and interpretation, and only later proceeds to the study of the grammar and syntax which embody the principles of the language. In pathology an attempt is made to force the student to make a speech before he can lisp; he is expected to understand the language before he can interpret the meaning of simple sentences. My criticism of the ordinary pathological course is that it is too advanced for the student; that he begins at the wrong end of the subject; that his lectures and museum would provide an admirable sequel to a more elementary education on the subject, in which he should be instructed in following the correlated clinical phenomena and anatomical changes in straightforward, typical cases, and in which the anatomical material should be arranged in such a manner as to provide him with a complete picture of the end-results of pathological processes in organic relation to each other. In addition to this the organs from interesting cases should be preserved temporarily; accurate histories and clinical findings should be prepared, and the specimens should be demonstrated twice or three times to students and also to their clinical teachers. The specimens might be discarded in two or three weeks to make room for others. In this way the student and clinical teacher would acquire the habit in the ward of interpreting their cases from an anatomical standpoint, and of anticipating in an intelligent manner the prognosis or fate of the case.

In turning from the course itself to the nature of the teaching there are some points worthy of consideration.

I remember a time, and that can only be a few years ago, when pathologists regarded the field of pathological anatomy as cultivated and reaped to the last inch. In every condition which had come within the nomenclature of disease, changes degenerative, proliferative, and transformative had been described *ad nauseam.* Perhaps it was that the discoveries in bacteriology provided a fresh incentive to enter on new and more promising enterprises. But bacteriology has had its disappointments, and while its contributions to the knowledge of disease in general have been enormous, apart from its importance in public health and social hygiene, it has not fulfilled in its influence on everyday medicine, the promises of twenty years ago. With something resembling the appearance of despair recent investigators have been turning to chemistry, hoping, no doubt, to find there a solace for their hopes which have been frustrated in other directions. Not that I would say a word in discouragement of research in pathological chemistry, but such research should not be regarded as a last resort in attempting to unravel problems of disease, and the result should not be so construed as to distract the attention of the student from the primary and fundamental importance of pathological anatomy. Anatomy has been, and will continue to be, the essential basis for the study of disease, and one would imagine that there must be something in the point of view of the pathologists which has produced this feeling of lassitude and monotony which has sought relief in bacteriology and chemistry. I would suggest that stagnation has arisen in the interest in pathological anatomy for the simple reason that for many years the best pathologists have pursued it as a cult, instead of keeping their minds open to the demands and necessities of practical medicine. The descriptions of the histological features of diseased organs had become an end in itself; the fixation, mordanting, and staining of tissues had become a fine art; and the descriptions of the microscopic appearance of diseased tissues had reached a point where, in most cases, they had no bearing whatever on diseased organisms so far as the interpretation of illness was concerned. It was tacitly assumed by many teachers and by most students that more could be seen through $\frac{1}{6}$ than through $\frac{1}{4}$, and that through $\frac{1}{12}$ oil immersion lens there might be found a still more reliable avenue to an explanation of the hidden processes of disease. The pathological journals, especially on the Continent, were composed of long articles with beautiful illustrations provided from sources of great industry and considerable ingenuity, but tending nowhere. It was little wonder then that the pathological anatomist turned to the more promising fields of bacteriology and chemistry.

But this diversion was due to a mistaken method in the province of anatomy and a limited conception of its possibilities. The mistake has arisen by an undue concentration of attention on the end-results of disease, on the disorganised wreckage as it is found on the post-mortem table. If part of the care and speculative intelligence devoted to descriptions had been directed to a reconstruction of the processes which lead to final dissolution, the results would have been different. It is not only that co-operation between the pathologist and the clinician has been deficient, but on his own account the pathologist has been absorbed by the interest of the morbid state to the neglect of the morbid process. Descriptive pathology, and of course histological pathology, has made enormous advances since the days of the Hunters, but there has been no corresponding advance in the functional pathology which constituted their immortal legacy to medical science.

In recent years the teaching of normal anatomy has been revolutionised in this country by Keith and Elliot Smith. Their influence has probably permeated every medical school and must be reflected in the more vital and more practical conceptions which the students now receive in their anatomical teachings. They have discarded the "dry bones" anatomy of facets, grooves, minute distributions of nerves and meaningless relations, for an anatomy where structures and relations are interpreted in the light of function. The pathologist and the clinician have unique opportunities for furthering the progress of this aspect of medical science, and the work which has been done on the blood by Ehrlich, Muir, and Browning, on the heart by Mackenzie, on the arteries by Allbutt, on the liver by Rolleston, on the kidneys by Bradford and Herringham, and on bone by Macewen should be carried on in the observations of disease in these and in other organs. Medical science requires, and the student ought to have, a pathology of the living, instead of a description of the dead.

Take, for example, the pathology of rickets as usually presented to the student. His attention is directed almost exclusively to thickenings of the bones at the epiphyseal lines, to abnormal vascularisation of the irregularly growing cartilage, to the formation of osteoid tissue, to processes of decalcification, absorption of old bone, and to irregular deposits of salts in the areas of new bone formation. It may be suggested to the student that the condition is due to an organism not yet discovered, or to some perversion of internal secretion, or to abnormality of metabolism in special relation to the calcium salts; to some abnormality in the blood; to intestinal or auto-intoxication, the last resort of those who, having discarded the dispensation of Providence, must have an explanation of some sort. But whether or not he make reference to these vague suggestions he should attract the attention of the student in two directions: backwards in the course of events to the genesis of the rachitic disorder, to something as big and obvious as a three-storeyed tenement with a single apartment on the top flat in which are crowded in a dark, fusty atmosphere, a father and mother and six children; and he should look forward to the sequence of events in which the bone transformations are but links in the chain; to the loss of elasticity in the thoracic walls, with possibly atelectasis and broncho-pneumonia, especially in the event of measles or whooping-cough; to the atonic state of the abdominal muscles with intestinal disorders; to the stunted physical and mental growth, which leave the victim of rickets in so many cases a moral and economic incubus on society. It is, no doubt, a matter of much academic interest to discover whether rickets may be due to an infection whose toxins poison the growing bone, or whether the perverted metabolism, due to obscure chemical causes, brings about the osseous change, or whether the lesion is associated with some vital and subtle abnormality in the actual growth of young bone as such; in other words, whether the cause is bacterial, chemical, or vital, or a combination of some or all of these factors—these, I say, may be considered of great academic interest—but the important thing for the student to know is that this condition in its origin is associated with well-defined factors in life, which he may be able to influence in the course of his work as a medical practitioner; and he should have the authority of the pathologist for believing that once the rachitic condition has supervened the morbid course of the disease may be so directed or deviated as to avoid the fatal complications which it carries so often in its train.

Perhaps even more suggestive, from the point of view of functional pathology, is the condition known anatomically as arteriosclerosis. It is described to the student of pathology in comparison and in contrast with atheroma—a form of arterial degeneration with which it has absolutely nothing in common, either as an illness or as a morbid state or process. But this comparison and contrast rivets the attention of the student on certain facts which tend to distract his mind from a serviceable appreciation of the important features of the process underlying arteriosclerosis as a disease. He knows, for example, that in arteriosclerosis the muscular tissues of the arteries and arterioles are fibrosed in their whole length and circumference, whereas in atheroma the degeneration is patchy and at first in close proximity to the intima. He knows that arteriosclerosis is associated with sclerotic kidneys and enlarged heart, whereas this is not the case in atheroma. In the wards, if the conditions are differentiated at all, he hears arteriosclerosis referred to as a form of chronic Bright's disease, or as a cardio-renal case. He may be told that clinically there are certain characteristic retinal changes, that the blood-pressure is abnormally high, that the heart is enlarged, and that the kidneys are in a state of fibrotic degeneration; but neither in the wards nor in the post-mortem room is he presented, as a rule, with an account of the morbid process, which, lasting through years, culminates in the arterial fibrosis which accounts for the final state in which the patient succumbs. Yet, however obscure the vital or chemical factors which determined its origin and progress, there can be little doubt about the essential nature of the origin and progress, and there are few diseases which present such easily recognised functional derangements of an anatomical character leading to such obviously inevitable conclusions. It requires no great knowledge or imaginative power on the part of the student to understand that the disease begins with what is probably a more or less generalised increase in the arterial tonus, depending upon some irregularity in the vasomotor system, probably associated in turn with perversion of the internal secretions. The increased arterial tonus is met by an enhanced effort on the part of the heart to meet the demands of the body tissue for nutriment. For a varying time the disease may be in progress without giving rise to illness, but sooner or later, when once the process has been well established, the enlargement of the heart does not suffice to overcome the peripheral obstacles. Among the earliest symptoms may be those referable to deficient blood-supply to the alimentary tract (for in most cases the mesenteric vessels are markedly involved); indigestion, flatulence, and headaches supervene. The kidneys, with their double capillary system, find difficulty in exercising their function of efficient elimination. The heart labours, and thumping noises are felt in the head, and palpitation is occasionally experienced. The heart may as yet be only slightly enlarged; there may be no albuminuria, but the blood-pressure is high. This may be the stage at which the unstriped muscle of the arteries is hypertrophied but not yet fibrosed. This is the stage at which therapeutic interference might be useful. But hypertrophy of the arterial muscle is followed by fibrosis; the resilience of the walls becomes diminished and the embargo on the heart is correspondingly increased. Further cardiac enlargement is evidenced in increase in blood-pressure in the middle-sized arteries; the heart fails to send sufficient nutriment to the tissues; retinal changes occur; the kidneys become fibrosed through the inability of the heart to force the blood through the double capillary system; the patient complains of cold extremities, for the blood, still in high pressure in the large arteries, does not reach its destination of metabolism, and there is usually an accumulation of fat as a result of deficient oxidation. The defective nutrition leads to a general lowering of vitality, and genuine nephritis or pericarditis may be the result. Œdema may occur as a result of failure of the peripheral circulation—and this may happen without true cardiac failure, for the heart may be twice or three times the normal size and the valves remain competent and the muscular tonus good. The cerebral and coronary arteries may not be involved in the process, although cerebral hæmorrhage may produce a fatal issue early in the disease as a result of high pressure in vessels which may eventually be atheromatous.

Such an account of this common ailment from the clinical and pathological standpoint could be easily grasped by the student, would excite an interest in the relation of pathological processes to end-results, and might be of invaluable service to him in his practical outlook.

There is still another aspect of pathology which should be constantly kept in view. On its positive side the main effort of pathological research is directed to the establishing of a nexus between processes of disease as exemplified in the reactions of abnormal function and the complaint of the patient. But the phenomena of complaint are far from being a perfect reflection of the processes of disordered function in the narrower biological sense. Disease may run a prolonged course, as in the case of chronic nephritis, cardiac degeneration, and many infections, before it reveals itself through the consciousness of the patient. Weeks or months, or even years may elapse before a well-established process of anatomical degeneration is manifested in illness; and the particular time at which such degeneration produces a disturbance of the equilibrium between the patient and his conditions depends not only on the stage of development of the disease but also on the susceptibility of the patient to an appreciation of disordered function. The subject of cardiac valvular disease, for example, may be unaware of his affliction until the occurrence of an emotional shock which lowers the whole tone of his nervous system, when he becomes aware for the first time of an organic disability which has been present for years, although never revealing itself so long as he enjoyed comparatively good health in other respects. It cannot be too strongly emphasised that when a patient becomes ill it is the whole patient who suffers and that the primary fact in his suffering is a disturbance of the equable accommodation to his surrounding conditions; and that every complaint that he makes must first reveal itself through his consciousness, whether it be palpitation, pleuritic pain, discomfort after food, paralysis of the hand, or defective vision. Each of these complaints must first pass through the medium of the brain before it becomes a complaint. It is, of course, in the first place the duty of the clinician to emphasise this to the student; but the teaching of pathology is, as a rule, so categorical in its methods that the student is apt to be misled, or at least disappointed in the later stages of his studies, if it be not emphasised early in his course that pathology has to do primarily and directly with disease and only secondarily and by inference with complaints.

And one may go a stage further than this and point out that there are numerous diseases and numerous complaints and organic disorders for which no well-defined anatomical, bacteriological, or chemical basis can be determined. These are functional disorders, often associated with what are apparently disturbances of the nervous system; there may or may not be an emotional or psychic factor in their incidence, and the site of the disturbance may be practically any organ or any system in the body, and in some cases more than one organ or system may be involved. One of their chief characteristics is the suddenness with which they disappear without leaving any trace of disability, even in cases where the organic disorder has been very profound, as judged by the degree of disability. An explanation of their nature is to be looked for in all probability in those vital forces which conserve the unity and vitality of the organism in its various relations. Organic changes and chemical or physical abnormalities are to be looked on rather as an expression than as a cause of the disorder. It is not to be expected that the student should be introduced to a serious and protracted study of this the most difficult side of medicine, but he should be warned of its existence from the very commencement of his clinical studies. No course of pathology is complete which does not include this warning and which does not, in that event, make it clear to the student that however many of the diseases and ailments with which he may have to deal can be explained on an anatomical, bacteriological, or chemical basis, there are many diseases and many ailments which cannot be interpreted on the basis of pathological teaching as commonly understood.

My contention then in substance is, that the teacher of pathology should have constantly in view—(1) the student; (2) the subject of pathology as it appeals to the student; and (3) the relation of pathology to the rest of the medical curriculum.

1. As regards the student, the teacher should recognise that he can be led into the kingdom of pathology as into the kingdom of truth only in the spirit of a child. He is capable of understanding only the simplest phenomena and has as yet no capacity for grasping the essential features of the principles of a science whose elementary facts have not yet been presented to his observation. In this context I cannot do better than quote the remark of Dr. Crouthers, a distinguished American preacher. "We sometimes think of the teacher as a lawgiver and of the learner as one who docilely regards what is graciously given. But the law to be understood and obeyed in education is the law of the learner's mind and not that of the teacher."

2. The subject should be taught so as to present the student with a clear conception of the nature of diseased processes as contrasted and compared with the nature of end-results; and no opportunity should be lost of demonstrating the relationship between organic changes and the clinical phenomena of disease; and also the negative side of pathology should be emphasised where opportunity occurs: namely, that aspect of the study of disease wherein it may be clearly shown

that the complaint from which the patient suffers is not necessarily the result of a recognisable anatomical change as a causal factor, but merely a transient disorder of a functional character simulating disease due to irreparable organic changes.

3. The teacher must bear in mind the relation of the subject to the rest of the medical curriculum and must himself be in the closest co-operation possible with those who are engaged in the interpretation of clinical phenomena; and if he is to secure for the subject of pathology its proper position from the point of view of practical medicine in the curriculum he may do so in the hours which are devoted with such futility to some of the other subjects. In this context one is reminded of the waste of time and nervous energy devoted to the memorising of insignificant and meaningless details in anatomy; and to the weary hours spent in listening to lectures in midwifery which deal, after all, with the theory of a simple physiological process and its variations and anomalies.

It seems impossible that there can be any far-reaching reform in the teaching of pathology which does not involve other subjects in the curriculum, and it will be difficult to secure any such reform until it is recognised that in the Scottish universities at least, medicine is still taught to a large extent by the methods which have been inherited in the history of the universities from the teachers of theology and metaphysics. These subjects it may be possible to teach from a chair, but pathology and medicine can be taught only in conjunction and in the laboratory and at the bedside.

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XIII.—PATHOLOGY IN GENERAL PRACTICE.

By JAMES S. EDWARDS, M.B., Ch.B., Bridge of Earn, Pathologist,
Perth Royal Infirmary.

I PROPOSE, as shortly as possible, to discuss the present position of pathology as it affects the general practitioner. And at the outset—speaking as one who has been able to combine with general practice a certain amount of laboratory work—I find myself bound to admit that the outlook is far from encouraging.

To the average practitioner the opportunities for pathological work are extremely limited. They are limited, in the first place, by the necessity of purchasing and maintaining a certain amount of rather expensive apparatus. The most willing workman can do nothing without tools, and the upkeep, even of a small laboratory, is an expensive hobby. His opportunities are limited, in the second place, by the totally inadequate payment for private laboratory work. Unless he is prepared to balance—against a great expenditure of time and energy—his own increased knowledge and enthusiasm, he must expect to face a dead loss. These reasons may appear sordid; but, after all, most of us are under the necessity of earning a livelihood. And it is not to be expected that many will care to take up as a hobby a branch of medicine so financially unremunerative as clinical pathology. It must be remembered that I am speaking now of the average general practitioner—not attached to any hospital—and relying for clinical material entirely on the cases occurring in his own practice.

Very different is the case of the practitioner attached even to a provincial hospital, and taking up pathology as a serious specialty. Here the opportunities—except in the matter of time—are unlimited. The point I wish to emphasise meantime is that it does not, and never can, pay the general practitioner to do his own laboratory work.

Lastly, the opportunities for pathology in general practice are limited by that great uneducated public to whom the very word "post-mortem" is suggestive either of morbid curiosity or diagnostic failure. And this, I think, is the most serious limitation of all. Nothing is more discouraging to accurate diagnosis, to careful clinical study, than the certainty that one's results can neither be confirmed nor confuted. We learn from our failures, our mistakes and uncertainties, but only in so far as we can eventually confirm them. The mysteries that remain for ever unsolved leave us only annoyed and with less clinical enthusiasm for similar cases in the future. Why are surgical cases so much more interesting than medical? The average practitioner will go miles to see his patient operated on. If there is some element of doubt in the diagnosis, he will give up almost anything to be present at the operation. And not merely to see a display of technical skill on the part of his favourite surgeon. Far more to satisfy himself, to see with his own eyes the actual morbid condition he has already visualised mentally. Surgical pathology is a reality—a visible and tangible reality—not a mere memory of text-book descriptions. Were medical pathology the same, we should gain in self-confidence what we might lose in self-complacency. Pathology makes for precision; it deals with facts. And the greater our power of visualising the underlying pathologic process, the closer we come to a proper concept of disease. We are too apt to be content with symptoms—to diagnose, to treat, even to certify symptoms. We lose sight of the wood for the trees. Losing all hope of eventual certainty, we become content with slipshod methods—incomplete examination, doubtful diagnosis, and symptomatic treatment. Our knowledge of morbid anatomy atrophies from disuse, and pathology ceases to affect the general practitioner as soon, and as completely, as the general practitioner ceases to affect pathology.

This may be a depressing picture, but it does, I think, truly represent the position of pathology in general practice to-day. Now, if the future of medicine is, as it must necessarily be, to a great extent, dependent on pathologic research, surely it is of the utmost importance that the general practitioner should be encouraged to maintain his interest in pathology. In the great majority of cases he cannot, for the reasons I have given, be expected to do the actual work for himself. But if he is sufficiently interested, sufficiently encouraged, he can and will supply the material.

Here is a point I would like to emphasise. The only material that is really valuable, from the point of view of morbid anatomy, is the case that has already undergone thorough clinical investigation. And, as Mackenzie has pointed out, it is only in general practice that we can follow disease from its origin. The specialist, the hospital physician, the pathologist, all of these see disease largely in its advanced stage or its termination. It is to the general practitioner we must look for further research into the earliest symptoms, the gradually progressive course. But the fullest and most accurate clinical study is of little value without confirmation. It is here that pathology must come forward to take its part. And by pathology I mean every branch of the subject, every test of the clinical laboratory, from a simple blood count to a full post-mortem examination. If the general practitioner cannot supply these for himself, they must be provided for him. They ought to be provided for him. To some extent they are, but how little they are taken advantage of. The reason, I think, is not far to seek. Before he is likely to take advantage of the opportunities, some of which are, all of which I hope will eventually be, open to him, the general practitioner must *himself* have had a thorough training in pathology. He must *himself* take an active interest in morbid anatomy, even at second hand. If you will allow me a few minutes, I should like to put before you a short constructive policy which, I think, would make for a better appreciation of pathology in general practice. And first let me state three axioms:—

1. Every graduate should have a thorough training in pathology, both theoretical and practical. This should be sufficient to allow him, should he find the opportunity, to carry out for himself not only routine laboratory work but also research. More important still (for pathologists can always receive special post-graduate training), it must be sufficient to impress on him for all time the necessity of taking advantage of the opportunities which we hope will eventually be offered.

2. Every general practitioner should have the right to a laboratory report on any pathologic material. And this at no expense to himself or his patient. Further, this should certainly include the right to the services of a competent pathologist to perform a post-mortem examination in any case of interest. From personal experience I am sure that the practitioner would more easily obtain permission for such examinations had he not himself to take an active part in them.

3. Every provincial hospital should be provided with a fully equipped laboratory and a whole-time pathologist. I say *whole time* advisedly, for I am sure that a part-time man can do justice neither to his laboratory nor his practice, neither to his colleagues nor to himself. Further, unless some time is to be given for original research, the pathologist is bound to degenerate into a mere mechanic.

There may be some strong arguments in favour of centralising all laboratory work round the teaching schools. Nevertheless, I am quite certain that the only method of bringing pathology into active touch with the general practitioner is through the medium of the local hospital. All such local laboratories must, of course, be in intimate touch with the pathology department of some university, so that the more difficult examinations may be submitted for expert opinion.

The last two propositions, I am aware, can only take effect under some scheme of State Medical Service. Therefore we need not discuss them further meantime, except to point out that under any scheme of State control it is essential that pathology should receive adequate recognition, and that local laboratories should be recognised as essential.

It remains only for us to consider how the student can best obtain a suitable training in that subject which is so essential not only to his own knowledge of medicine, but to the whole future of medicine itself.

Here I must apologise for venturing an opinion at all, for I am now far out of date. During the last ten years the teaching of pathology has improved so much, at least in Edinburgh, that there is comparatively little one can suggest in the way of improvement. My information regarding the present teaching is, of course, second-hand, gathered from recent graduates, clinical assistants, and residents at our Infirmary. They are certainly much better grounded than we were ten years ago, but their education still, I venture to suggest, bears the same taint. They are academic rather than practical. In every case they know (theoretically) what the laboratory findings ought to be. In most cases they admit to having been shown the procedure perhaps once. But almost invariably they show the same hesitation in how to proceed, the same complete want of confidence in their methods, and consequently in their results. This want of confidence has struck me more than anything else about their practical training. The student never seems to get sufficient practice with the methods to become thoroughly familiarised. And it is only familiarity with the technique that breeds a proper contempt for the possibility of failure.

The cause, I think, may possibly lie in the overlapping of the different practical classes. In histology the student is taught practical histological methods. Next year he is again taught the same methods —with considerable variations—in the class of practical pathology. Finally, he does the work for himself (which, of course, is the only possible way to learn) in that excellent class, instituted since my time —the class of morbid anatomy. His practical bacteriological methods are, I understand, merely suggested in the class of bacteriology, though he can get a full training in the advanced class, which is not, however, compulsory. His other practical methods—blood counting, examination of blood films, differential counts, blood-pressure readings, and polygraph tracings—he may, or may not, pick up for himself. I understand they are taught in the tutorial classes of clinical medicine. You may say that this is not pathology. But I venture to assert that there is often more practical pathology in a polygraph tracing than in a whole post-mortem examination.

Further, these are the only branches of pathology on which the general practitioner is likely to have the opportunity of study in after-life. The only pathological material constantly to his hand will be the blood and the various exudates. The general practitioner, provided with a serviceable microscope and an adequate training in the morphology of the blood-cells, is never likely to lose his interest in pathology.

To come to details. I would like to offer the following ideas :—

1. That practical classes should be restricted to practical work, and only to such work as is likely to be of value to the student in later life. There is no place more unsuited for imparting theoretic knowledge than a practical class.

2. That the classes of histology and practical pathology should be combined into a class of histo-pathology, in every case the normal being compared and contrasted with the abnormal. No practical methods should be taught in this class.

3. That practical histological methods should be taught in the class of morbid anatomy, this class being extended if necessary.

4. That bacteriology should be a lecture class, and compulsory.

5. That there should be a compulsory class in laboratory technique. In this the student should be taught how to make and use capillary pipettes, using the air-bubble index, and to handle minute quantities of serum, etc. He should be taught not once, but many times, how to put up sedimentation tests, to plate out specimens of urine, sputum, etc., to pick off and examine the colonies for himself, and to make simple vaccines.

That the tutorial classes in clinical medicine should be made actually, not theoretically, compulsory, and no student should get a certificate till he is thoroughly conversant with all methods of blood examination, sphygmomanometry, and the interpretation of cardiograph tracings.

Lastly, every possible means should be taken to correlate the teaching of pathology with that of clinical medicine. It should be compulsory for the clinical clerk in every case in which a post-mortem is obtained to attend the examination and to demonstrate the specimens at the next clinique. The morbid anatomy of cases which have not previously been examined clinically can never be of the same value as teaching material. It is the spirit of research that must be fostered, the ambition to follow our cases to their ultimate conclusion. Research is the true spirit of medicine, and it is only by stimulating this spirit in the work of the student that we can keep it alive in the work of the general practitioner.

XIV.—THE TEACHING OF PATHOLOGY.

By Professor LORRAIN SMITH.

The aim which is before the teacher of pathology is to train the student to interpret the process of disease by a study of the changes in the organs and tissues of the body. In doing this he will inevitably find himself compelled to deal with problems which are primarily the matter of the physician or surgeon; but his own question is clear enough, and we need not spend much effort in trying to make a perfect delimitation of the pathologist's territory.

The science has developed from systematic medicine and surgery, and in its first form it was the presentation of the history of disease, so far as it is revealed by structural changes and new formations that arise in the body, which has to adapt itself to pathological conditions.

A section on pathology has still its place in each chapter of the text-books of medicine and surgery, and one reason for this is that after study of the structural changes we are able to visualise the process of disease. If the student has once clearly and firmly imprinted on his mind the picture or impression of these modifications of structure, his knowledge of the disease will have a vividness and reality which is hardly to be obtained in any other way. On this account the study of pathology has been greatly valued by both teachers and taught.

In the scientific advances of modern medicine pathology has taken a leading part. It has extended its territory, and has come to be the science of disease in the sense that it includes the investigation of disease by all the experimental methods of biology, *e.g.* methods of histology, of chemistry, of physics; in fact, by all the methods which science has been able to apply to the investigation of the life of the organism.

In the advance which pathology has made it has come more and more near to the problems of the clinician. This is natural, for in the development of medical science it is clear that pathology and medicine must come ultimately to be one. Indeed it would appear as if already certain forms of diagnosis are never to be taken from the pathological laboratory, and certain forms of treatment are left in the hands of the pathologist.

The teaching of pathology must keep pace with the all-round progress of the science, and it will clear up the inquiry which the Club is making into this branch of the subject if I state shortly the method of teaching which we have now adopted in Edinburgh.

The general purpose has been to bring the teaching of pathology and bacteriology into the closest possible relation to clinical teaching. The student begins the study of systematic medicine about the same time as he begins to work at pathology, and the two courses are arranged to correspond with each other. The circulatory system is taken up at the beginning of each course; this is followed in each by a study of the respiratory system, and then of the digestive system, and so on. It is less easy to co-ordinate the clinical courses, but I am convinced we will find it worth while to do more than we have attempted hitherto.

In the pathology department the course consists of about sixty lectures on systematic pathology, twenty lectures on bacteriology, ten practical meetings for morbid histology, ten practical meetings for bacteriology. In this way the hundred meetings of the class are utilised. These are supplemented by an indefinite number of demonstrations in the various branches of the subject. There is also the class in practical pathology, in which the student spends six hours a week for a term, and gets about one gross of sections illustrating the commoner pathological conditions, but it is really a course of morbid histology of an abstract and antiquated type.

There is finally, the most important of all, a course of morbid anatomy in the Infirmary. In this the student is introduced to pathological investigation. He is required to work out a report on the pathology of six cases—three in each of two terms. He is supplied with the details of the clinical record; he makes notes of the post-mortem examination, and gives a description of the appearance of the affected organs in each case. He is also required to investigate these tissues microscopically. After this he writes a summary or review dealing with all the points of pathological interest which the study of the case reveals. In short, he is required to write a report on the case as complete as he can make it. It takes usually three weeks to accomplish this. At first a great deal of personal teaching is required, but by the time the third case has been done the student has made great progress in the art of writing reports. Having written his report, he hands it in along with the slides he has prepared. On the report and the slides criticisms are made by the staff, and values in marks are given for each report; these values are included in the total which determines the class honours.

The result of this method is that the student grasps the unity of disease from the first. It is the whole case he has to consider and explain, and the idea of development of disease and sequence of events and inter-relation of various systems, so far as it can be seen in the study of pathological changes, is clearly brought before him. It is far and away the most interesting form of pathology; the student discovers this at once, and his interest is as keen as any teacher could desire. He learns that, in order to understand disease, he must trace it from its earliest to its last stages. In doing this he finds it necessary to guide himself by using all the data there are available. The symptoms, from the earliest to the latest, are carefully noted. One of our students last year, on whose imagination the history of a case of ulcerative endocarditis had taken hold, remarked that "the stream of mischief had its visible source in highlands of the patient's past sixteen years ago."

The progress of the disease is followed in a study of the patient's medical history, and the problem takes the form of trying to discover in the tissues the structural changes which correspond to the successive stages of the development of the illness.

Disease, therefore, becomes a history and a unity in his mind, and he becomes alert to discover indications of any kind which throw light on the process. In short, pathology taught in this manner serves its fundamental purpose of awakening the student's mind to the meaning of disease, and aids him in the difficult task of interpreting cases in the wards.

This winter's programme, part of which has been carreid out, is as follows:—

1. A case of infective endocarditis, with the usual complications.
2. A case of pulmonary tuberculosis in which there was tuberculous broncho-pneumonia, with a cavity in the apex; diffused tubercle of a miliary type in lung, liver, spleen, kidney, and meninges, etc.
3. A case of pernicious anæmia, with well-marked changes in bone-marrow, spleen, liver, kidney, and heart.
4. A case of myeloid leukæmia, with changes in bone-marrow and various viscera.
5. A case of chronic interstitial nephritis, with arteriosclerosis and cerebral hæmorrhage.
6. A case of atrophic cirrhosis of the liver, with malignant growth.

We divide the class into groups of five or six members, who work together. Unlimited debate with each other and with the teachers goes on. The student is encouraged to get help from any quarter in which he can find it. The one condition of the work is that the report is his own composition.

I may add that the teaching museum is essentially a collection of cases; all the affected organs from a given case are mounted together, and for each there is a type-written fasciculus giving the clinical history, the post-mortem report, a description of the microscopic findings, and finally a discussion of what the student should learn from the case.

It may seem to the Club that the course has been taken to the limit of practical teaching, but I do not think that has even yet been reached. So convinced am I of the value of teaching by means of complete cases and case studies that I wish to see the pathology course planned out on this basis. As yet we have still the old system in the background. We have broken it up in two ways. Firstly, since the Chair of Bacteriology was established there have been two teachers, and that gives the student a helpful and stimulating change of diet, with, incidentally, a peculiar joy in trying to find diversity of teaching. In the second place, we have a number of days for practical work in practical bacteriology throughout the session, and this, again, lightens the burden of lectures.

I would, however, like to see a course planned somewhat as follows:—The students might commence pathology in the summer term, three months before they begin work in the wards. They would in this way have the advantage of an introduction to pathology a little in advance of their clinical work, while the greater part of their pathology course would be given along with the teaching of medicine. I would replace the morbid histology course in summer and the lecture course in winter by a combined course of lectures and practical work, the practical work being primarily the investigation of cases. I would begin the course with a few lectures on inflammation, but as soon as possible I would adjourn the lecture class to study, say, a case of infective endocarditis, with its thrombi and foci of infection and inflammation in lungs, spleen, kidney, brain, etc. When the student had seen all the reactions of inflammation in vascular and avascular tissues, and had seen the toxic necrosis, the phagocytosis in the spleen and glands, the leucocytosis of the blood and the activity of the marrow, the degenerations in the heart and glands and so forth, then I should give him lectures on the subject and deal with any points that had not been included. At the same time he would begin the course of bacteriology, and he would have, in the first place, to take up the study of bacteria of septic infection.

The student would then take up the study of arteriosclerosis and myocarditis in another case with aneurysm, etc. This might be supplemented by one or two lectures on diseases of blood-vessels. We would then pass to the study of the respiratory system. Pneumonia in its two forms—lobar and lobular—might be studied in two cases for the first report; pulmonary tuberculosis with extensions, such as intestinal ulcerations; general tuberculosis, etc., with degenerative destruction of the tissues—amyloid, hyaline, fatty—in the various organs. Add to this a dust disease, with dilated right heart and chronic venous congestion of the viscera, and the student would have so much real knowledge of the lungs that it would be appropriate to give him a few systematic lectures on the pathology of the diseases of the respiratory system. He would at the same time continue the course of bacteriology in relation to pneumonia and tuberculosis.

It is unnecessary to continue filling in further details; the general principle is clear. We should teach pathology from the study of actual cases, in place of attempting to make the study of books or systematic lectures the basis, with a certain amount of practical work added. We require to apply what is agreed to be a truer conception of scientific teaching. The old course of systematic lectures has had its day as a method of teaching pathology. There is no subject in the medical course which is so easily taught in a practical fashion as pathology. There is no lack of material, and in teaching by case reports in the manner I have sketched the student is introduced to the method of inquiry and investigation which he is expected to continue in his clinical studies. Nor do I find it difficult to rouse in his mind the interest which a case should present as a subject of research. It is unwise, I think, to ask students generally to take up research while they are undergraduates, but it is disastrous to fail to create an interest in research which will bring them back to post-graduate study when the opportunity offers.

Should systematic lectures be dethroned from the chief position, I think it would be necessary to adopt some method of issuing to the class a printed statement which would form a substitute for lecture notes. Were this done, I think only benefit would result from giving systematic lectures a subordinate position in the course.

I have said that the attempt has been to bring pathology into close relation to clinical work. While we are doing this, we would claim that by co-ordination of methods the value of the teaching in pathology should be duly conserved in the later clinical studies. This should be done by including in the clinical reports which students are trained to make in the wards a complete statement of the pathology of the cases. This can be done in two ways:

1. The clinical case report should include a definite statement of the findings by the methods of clinical pathology and their relation to the development of the disease.

2. Those cases which came to be examined post-mortem should be worked out in the manner I have indicated above, and a full statement of the post-mortem findings should be included in the report, and with this the student should furnish a summary and review of the case to make clear to his clinical teacher that he has grasped the whole case.

In this way we would go far to secure the co-ordination between pathology and medicine which we all desire.

[Dr. J. W. Dawson described in fuller detail the work done in the class of morbid anatomy, and read some reports that had been drawn up by students. He also demonstrated a few of the "cases" from the teaching museum.]

XV.—THE PLACE OF BACTERIOLOGY IN THE ORDINARY MEDICAL CURRICULUM.

By Professor RITCHIE.

I have to deal with the subject of the place of bacteriology in the ordinary medical curriculum. I shall do so as shortly as possible.

The function of the teacher of bacteriology in relation to the medical student is, I take it, to furnish him with the minimum amount of bacteriology which will enable him to understand the clinical cases he will come in contact with when he goes into practice. There are three main lines along which this instruction must go. First of all the student must have a knowledge of the part which bacteria play in the initiation of disease processes and in the phases of the successive phenomena which emerge during the progress of a clinical case. Secondly, the practitioner in modern times must be possessed of such bacteriological knowledge as will enable him to undertake those methods of treatment which have a bacteriological basis, methods which involve the application of sera, vaccines, and so on, to the treatment of disease. And thirdly, the practitioner must have a knowledge of how, during the life of the patient, he can get information as to the cause of the disease by the bacteriological examination of various exudates and of other material derived from a case; if, when he goes into practice, he does not undertake these examinations himself—which usually, of course, he does not—he must know what precautions ought to be taken in order that the material may be sent to a clinical laboratory in proper condition, and he must further be able to interpret the reports which he receives from such a clinical laboratory. These are the three objects which the bacteriological teacher must have in view in dealing with the medical student. The dominating factor of the situation is this, that bacteriology must be treated as a branch of pathology. In modern times pathology has gained a new insight into the processes of disease by the knowledge which has been acquired by the bacteriologist. The phenomena of inflammation become more and more intelligible when considered from the bacteriological standpoint, and a new interpretation is given to the conception of the reaction of the body to disease which plays such a great part in pathological processes. In fact, it may be said that it is bacteriology which has placed this conception of reaction upon a scientific basis, for although reaction is in essence a physiological process, it only finds proper elucidation when examples are taken from what occurs when bacteria get entrance into the body and call out phenomena which represent the fighting power of the organism. From its own standpoint, bacteriology gains much from association with pathology; if in connection with medicine it is not associated with pathology it becomes a very inferior and incomplete branch of botany. Therefore it is essential, I think, that in trying to work out, as we are doing here, the place which bacteriology is to hold in the medical school, we should make the teaching a part of the pathology course. As Professor Lorrain Smith has indicated, that is what is being done in this school now. I cannot do better than follow his example, and give an outline of how at present this is actually worked out.

First of all there are the systematic weekly lectures, twenty in all, during the two terms of the systematic course. We have already had a considerable expression of opinion here as to the place which systematic lectures are to occupy, and I would like to say that as matters are at present constituted, it seems to me that the systematic lecture occupies a very integral part of the course. It is all very well to say that a student can get up his information from text-books. In bacteriology, to ask a student to get up a text-book is simple cruelty, because there is no text-book that does not give a great deal more than is necessary for the ordinary medical student to know. And further, unless there is regular tutorial supervision of the reading of the student—such as exists in the older English Universities—he will not read what he ought to read at the proper time: without such supervision he can have no guidance as to what he ought to read and what he ought to leave out. The systematic lecture does to a certain extent supply this guidance. In the lectures given in the pathological department here the main points regarding, not uncommon diseases, but the common bacteriological diseases of man are taken up and emphasised, and thus the student gets to know what is important and what he may pass by. As far as possible the lectures in bacteriology are correlated with the other systematic lectures in pathology. For instance, Professor Lorrain Smith commences his course with a consideration of inflammation. At the same time I take up a simple bacteriological inflammation, such as pneumonia, and follow that up with the more complicated case where suppuration is interposed as a stage in inflammation. Then one goes on to deal with an example of a chronic reaction to a long-standing irritant such as one finds in tuberculosis. I may say here that not only are the lectures on bacteriology correlated with the lectures on pathology, but they are also correlated, when opportunity arises, with the practical work which is being done in the morbid anatomy class. For instance, this year the students were doing a case of tuberculosis, and I took up tuberculosis and treated of the points which were raised in the actual case the students were working at in the pathological department of the Infirmary. In the twenty lectures one can deal thoroughly with the ordinary infections, inflammation, suppuration, tuberculosis, a pure intoxication like diphtheria, and the more complicated pathological picture found in infections with the typhoid organism, and meningitis, gonorrhœa, syphilis, and other infections are also dealt with. Then we go on to more general bacteriological pathology, taking up the lesions which bacteria are capable of originating. Then we have to tackle the difficult task of giving the student such knowledge as he requires regarding modern methods of treatment which have a bacteriological basis. This leads us into the realms of immunity, which I never approach without trepidation ! Here I try as far as possible to give as many of such facts as there are, and not to allow my imagination to soar into those regions of fancy to which Professor Dean has alluded. When all is said and done, the fundamental facts of immunity are few ; they are, however, not simple, and it is the most difficult task of the bacteriologist to get the ordinary medical student to comprehend them.

With regard to the practical work, this consists of ten meetings. In the October term the men who have had out practical pathology the previous summer have their bacteriological course, and after Christmas the men who began their pathology in October have theirs. In that way one can reduce the size of the classes to reasonable limits ; we aim at having not more than fifty in a practical class. Further, we aim at having a student demonstrator for about every eight students in the practical classes. I consider this supervision by student demonstrators absolutely necessary, and I do not think that one demonstrator can attend to more than ten students at most at a time. In this practical course no attempt is made to give the students an intimate knowledge of bacteriological methods. They do not make culture media ; they have the methods of making them demonstrated to them. But they themselves put up a series of preparations of ordinary organisms and of morbid tissues containing these organisms, and thus they practise all the ordinary elementary staining and cultural methods. They also have to do certainly one experiment in agglutination, but beyond that the serological methods (for example, the Wassermann reaction) are left to demonstration.

There is a third series of classes which we have developed within the last two years, and which, I think, will prove the most valuable part of the ordinary bacteriological course. In this third section, which comes after they have had the elementary practical class, the students are divided up into small groups, the size of which depends upon the size of the class—say about ten to eighteen students in each group, and they work at *clinical bacteriology.* Each student goes through a course of eight meetings of two hours each devoted to this subject. We take any material which may have come in to the three laboratories at our disposal — sputa, pus, urine, fæces, cerebro-spinal fluid, etc. We give the material to the students without telling them what they are to do with it. They must discuss what ought to be done, and, of course, we give them direction in deciding this, and then they proceed to do whatever is necessary for the preparation of a report. In this way they get to know what can be done by clinical bacteriology and its limitations, and I think this work will help them to interpret reports which they will receive from clinical laboratories when they go into practice. At the end of this short course they have to send up their slides and the notes they have taken. In these notes they must state the problems they have studied, the methods employed, and the report which they would issue. These notes are gone over and criticised in order to show them where they have succeeded and where they have failed.

This, then, is briefly the instruction given at the present time to the students of pathology in the branch of bacteriology. More and more we are trying to bring bacteriology into correlation with clinical medicine, just as in the other branches of pathology, and I hope that in the future there will be still further development along the lines of encouraging the men, who are working in the wards, personally to take material from the cases they are interested in and to work it up, and such observations will, I trust, come to be a feature in the reports which they submit to their clinical teachers in the ordinary course of their ward work.

DISCUSSION.

Dr. James Miller.—There are many ways of preparing a student for examination, but there are far fewer ways of teaching him a basic understanding of the subject. Probably the oldest way was for a man with a message—the professor—to gather round him a group of disciples, and by a system of question and answer and an interchange of ideas to work out the subject. That, I take it, is still the best way. Somewhere in the Middle Ages the system of lecturing from a chair was introduced. It has its advantages, and in the hands of a proper teacher who can impress his personality upon the student may be very valuable, but it cannot be compared with the other method adopted by Professor Lorrain Smith in the teaching of morbid anatomy. It interests the student, and it brings him into touch with the patient.

Dr. Edwards has drawn attention to the fact that the pathologist tends to degenerate unless he carries on research; but there is another thing that he *must* do—he must keep in touch with the clinical aspect of affairs, and this method of teaching pathology forces him to do so. I must cite some disadvantages, but they are not inherent in the method. One is, that it necessitates a large staff; a single individual cannot carry out this method of teaching. The men must be gathered in groups, and by the system of asking and answering questions the requisite knowledge must be instilled into their minds. Secondly, this method imposes a great amount of work on the teacher in annotating and criticising the notes of the students, without which justice would not be done to the individual. The method also tends rather to widen the gap between the bad and the good student. It increases the number of good students undoubtedly, but the others, I think, tend to fall behind, and require "coaching" to get through their examination.

No student ought to leave the university without having done at least one post-mortem examination, and knowing how to carry it out. One would also like to give him a little more instruction on how to send material for examination to the pathologist.

Dr. Stuart M'Donald.—The discussion to-night shows us that pathology is indeed alive, and that it is now being widely recognised that, if it is going to mean anything at all, pathology must be brought into direct relation with clinical medicine ; and also, that in planning the education of the medical student, we are aiming at turning out a first-class general practitioner and not a specialist in pathology.

With reference to the necessity of teaching the average doctor how to perform a post-mortem, I agree that it is desirable ; but will one, will twenty, will fifty post-mortems teach him? I question very much. One sees the most fearful attempts at post-mortem examinations made by colliery doctors in compensation cases, and seeing these one realises how important it is that during the time a man is studying medicine he should be given the amount of information which will enable him at some subsequent date to do a post-mortem thoroughly.

I agree with Professor Dean that pathology should be divided into two parts. There should be, as soon as the student has finished his examination in anatomy and physiology, a short course of general pathology, which would serve as an introduction to his clinical work ; and later in the course—not necessarily all at once—there should be an extension of that teaching—possibly one lecture a week throughout the rest of his course would meet the position rather than a separate complete course at a fixed period in the curriculum. Personally, I find in trying to teach pathology nowadays that the subject is too huge to get through in the time at our disposal, so that we can only try to teach general principles, and hope to keep the students' interest in pathology alive by the demonstrations later in the course. With Professor Lorrain Smith's case method I am familiar, and I have with some success endeavoured to carry it out in my own classes, although I think that he meets with more success here, because in this school the men start medicine earlier than with us. The special advantage of the case method is that the men are taught to think, and any method which makes the student think is to be encouraged. The case method is only an extension of what was done for clinical medicine here by Sir Thomas Grainger Stewart, who taught first and foremost the great importance of studying one case thoroughly. I quite agree that two or three cases studied as those of Professor Lorrain Smith have been studied will do infinitely more for the student than a whole course on the old lines.

With regard to the education of the students in clinical pathology, I feel that more use could be made of the appointment of pathological clerks, and that it should be the duty of the clerk attached to the pathological department not only to see the post-mortems and to assist in writing up the notes of them, but he should also be brought more in contact with the clinical material which is going through the wards, to see what can be gained by a study of disease from that direction.

Regarding most of the aids to diagnosis in the direction of clinical pathology, what we want is to teach the student what he is likely to gain by sending his material to a competent observer rather than to teach him to make the observations for himself.

The pathologists should not claim any more time than is at present allotted to them in the curriculum. I will yield to no man in my idea of the importance of pathology in medicine, but at the same time we must recognise that a student might spend too much time at pathology, and that anything tending to take him away from the actual study of the clinical case is to be deprecated: but I do feel that the time he already spends at pathology might be of more value if it were brought into more direct touch with clinical medicine. For the last three years I have been more of a physician than a pathologist, and although I regret the time in many ways, yet I think I have had valuable experience, which has made me infinitely more sympathetic than I was before, and will probably make a better pathologist of me in the end. At Newcastle just now we are concerned with a big scheme for the extension of our hospital. Together with that there will be a considerable addition to the pathological department, and in a report I am sending in presently with regard to the developments there, I have proposed that the pathological department should be taken quite out of the College of Medicine and put in the middle of the Infirmary. Until pathology is in absolute touch with clinical medicine we will never get the best results.

Dr. R. D. Clarkson congratulated the students of to-day on the fact that pathology is no longer divorced from medicine ; yet he felt that the students might easily devote too much time to pathology. To the pathologist a complete case is a case that has come to the post-mortem table : here there are so many changes that he feels could not possibly be influenced by drugs that he loses his faith in drugs, and becomes, from the point of view of the general practitioner, not quite so good as he might be. Enough stress is not laid upon the teaching of the processes of repair and compensation in the human subject. The "case method" does lead to it, but the case is not studied as it is recovering from the disease but as it has died from it.

Major Ruggles.—I should like to emphasise, from my own experience, the correlation of the normal with the abnormal by the study first of the normal tissues and then of those which show preliminary and later changes of a pathological nature. One of the greatest tributes that can be paid to pathology in my own country is that more than half of our foremost teachers of clinical medicine have laid the foundation by a special study and, in most cases, by the teaching of pathology. To become a teacher of clinical medicine it has become necessary to have first been a teacher of pathology.

Another point that occurred to me is the possibility of establishing a closer relationship between surgery, as well as clinical medicine, and pathology. A great deal of good would be done if the teachers of pathology could induce their pupils to enter the operating-room with a greater interest in the pathological condition of the case. In the Massachusetts General Hospital good use is made of pathological material through the circulation of case reports. The hospital has a course open to men in their last year, which consists of the study of the case reports and of the actual cases in the wards—surgical and medical. When the cases do not get well they are followed to the post-mortem room. Before the post-mortem is performed, the surgeon, the medical man, and the laboratory man, and perhaps some of the classes, are asked from the history and the temperature chart to make a differential diagnosis. These are recorded, and then the post-mortem is conducted. This is done in all teaching hospitals, and then the cases are printed and circulated. This circulation has grown enormously, and serves to keep people in non-teaching hospitals, and men in general practice, in touch with present-day methods of treatment and pathological examination. It has stimulated a great many men not only to a more thorough clinical study of their cases, but also to more earnest efforts to obtain post-mortem examinations.

Dr. Fowler.—Like Dr. Edwards I have been struck by the unfamiliarity with the methods of clinical pathology shown by many practitioners. I have lately had an opportunity of seeing a good deal of the work of men of different ages, and from different schools, and their knowledge of clinical pathology was undoubtedly below their knowledge of general medicine. This does not refer to the more complicated methods of diagnosis, but to such simple technical matters as making blood-smears and the like, which have been in routine use for twenty years. The blame for this appears to me to rest more with the clinical teachers than with the pathologist. For all that has been said there does not yet generally exist a real co-operation between clinicians and pathologists. The pathologist ought, I think, to be treated like any other specialist, and asked to see difficult cases with a view to suggesting possible methods of diagnosis. If students saw clinical pathology from this point of view they would better understand its importance, and in what sort of cases it is of value.

Mr. D. P. D. Wilkie said that although there were obvious reasons why surgical cases did not lend themselves so well to pathological investigation as medical ones, it was desirable to have on the staff of the pathological department one surgical pathologist (possibly a junior member of the surgical staff) who would conduct the surgical post-mortems. He urged the importance of more systematic collection and preservation of surgical specimens for teaching purposes.

Dr. Chalmers Watson advocated closer co-operation between the clinician and the pathologist in the interpretation of post-mortem findings to the students. The clinician is responsible for the fact that bacteriology is not more definitely correlated with medicine. The *rôle* of bacterial infection, *e.g.* from carious teeth, in causing disease is fully recognised, but the facilities for counteracting it are inadequate, even in large hospitals.

Dr. J. V. Paterson considered that the case-method of teaching pathology constituted a revolution rather than merely a reform. It reminded him of Kolisko's brilliant naked-eye demonstrations in morbid anatomy, from which he first learned the importance of correlating pathological changes with what is seen in the wards.

Dr. Traquair said that the public requires to be educated as to the value of laboratory investigation as an aid to diagnosis.

Dr. J. H. Gibbs emphasised the importance of directing the students' attention to the earlier stages of disease. If adequate attention were paid to dental treatment a great many diseased processes would be checked at the beginning, or possibly light would be thrown on the commencement of many chronic diseases.

XVI.—MEMORANDUM ON THE TEACHING OF MATERIA MEDICA AND THERAPEUTICS.

By Professor Sir THOMAS R. FRASER, M.D.

From the earliest period of medical education, and even before many of the subjects now embraced in medical education had been conceived of, Materia Medica has comprehended the physical, sensory and natural history characteristics of medicinal substances and the use of these substances in disease.

The growth of then existing sciences and the evolution of new sciences, such as those of physiology and pathology, led to much progress and expansion.

At the present time, and during the last half century, Materia Medica has so expanded as to comprehend (*A*) pharmacognosy, pharmacy, and the principles of prescribing; (*B*) pharmacology; and (*C*) therapeutics.

The two former are appropriate for instruction at an early part of medical study, whereas the third is, in most of its aspects, inappropriate until a late period and after knowledge has been acquired of pathology, medicine, and clinical medicine.

Founding upon this conception, a subdivision in education and study seems to be required.

(*A*) Pharmacognosy, Pharmacy, and Prescribing.—These subjects relate to physical properties. They are applications of physics, chemistry, botany, and zoology. They may well be taken at an early period of the curriculum—from the second to the third year. The practical importance of the knowledge embraced in (*A*) is apt to be overlooked. Briefly stated, the want of it would much cripple the practice of medicine. Ignorance, for example, of the physical and chemical conditions and solubility of medicinal substances might, and frequently does, lead to restriction in the selection of the most appropriate remedies in disease, *e.g.* in the uses of guaiacol and its carbonate, of the ethyl and methyl sulphon compounds, of bichromate of potassium, etc.

It has proved a great saving of time to deal with these subjects in a systematised practical form in the class of practical materia medica. A remarkable improvement has taken place, which, for instance, is shown at the Final Professional Examination in the generally satisfactory manner in which prescriptions are written, and in the fuller knowledge of pharmacognosy and pharmacy now gratifyingly recognisable and in great contrast with the chaos that distinguished the results of instruction formerly obtainable by apprenticeship to druggists and by the desultory and very restricted teaching in the laboratories of dispensaries.

In future, and especially because of the appearance and rapid growth of the biological subjects embraced in materia medica, it is desirable that the time set apart for (*A*) should be extended to the period of one term, with at least fifty meetings, in order that more time may be given to practical instruction and the study of pharmacognosy. Adequate instruction in it as well as in the other subjects embraced in (*A*), however, has been regarded as imperative since the beginning of medical education.

(*B*) PHARMACOLOGY.—Until about half a century ago the subject of pharmacology, on the other hand, was almost unrecognised. Since then it has rapidly grown with the development of chemistry, physiology, and pathology, so that at present its due consideration is hampered in a course of materia medica by the time required for the subjects embraced in (*A*) and (*C*).

Pharmacology deals with the action of medicinal substances in *normal* states of the living organism. The physical and sensory nature of the substances discussed must be realised by the student, and hence the indivisible association of pharmacognosy with pharmacology. If, however, in an enlarged course of (*A*) more were taught than at present of the physical and chemical nature and the sources of medicinal substances, mainly by demonstrations and individual study, only a very cursory reference to them would be required in the course of lectures on materia medica. Time would thus be gained for the much-needed expansion of the instruction in pharmacology. It is desirable that the latter should comprehend practical demonstrations of the more important actions, which would best be given to limited numbers of the class. The number of these actions suitable for demonstration, however, is only a small one. In almost no case could all the pharmacological effects of a single medicinal substance or of a group of such substances be demonstrated, and verbal descriptions would still be required before a true conception of the total multiple action could be realised. This is not merely a matter of scientific importance. In illness, it is often desired to combat a single symptom, but it should be known by the practitioner what other effects the selected substance causes, as these may be injurious and may limit the dosage to an unsatisfactory degree. It is a substance and not a pharmacological or therapeutical effect that is prescribed, and the substance usually produces many effects in addition to the one or even the several that are desired.

Just as it would be undesirable to avoid all reference to pharmacognosy, so also to therapeutics. The evidence of the action of many substances is based on the effects observed in disease even more than in healthy conditions. If the former were excluded, the valuable effects, for example, of many antipyretics, antimalarials and diuretics, *e.g.* quinine, diuretine, potassium acetate, salicyl compounds, would require to be ignored in the description of their actions. It is to be remembered also that the dosage of substances is estimated by their effects in disease and thus becomes a therapeutic as well as a pharmacological question.

It is of the highest importance that the subject of therapeutics should not be altogether eliminated from the teaching given in the ordinary systematised class of materia medica. Therapeutics cannot there be fully or elaborately taught, as the curriculum requires the student to attend the class before he has acquired an adequate knowledge of medicine and of pathology. Such therapeutics as is taught, however, requires that the teacher himself should have knowledge of practical medicine. He should be in personal contact with patients, while at the same time his thoughts and energies should not be diverted from his subject by the exactions of private practice. A limited number of medical beds should be assigned to his charge, if possible in a hospital in which clinical instruction is given. His teaching of pharmacology would thus be rendered more valuable to his students, as he would have the opportunity of keeping in touch with the requirements of practical medicine, by engaging in actual observation and experiment in the treatment of disease by medicinal substances, and of thus rendering his instruction in pharmacology more fruitful.

The Universities Commission of 1889 fixed the salary of the future Professor of Materia Medica at a lower sum than the salaries of the Professors of Physiology and Pathology, on the understanding that, conforming with the traditions of the Chair, he would engage in outside remunerative work. As in future his appointment would debar him from such additional professional work, it is reasonable that the salary should be the same in amount as the salaries of the Professors of Physiology and Pathology.

(*C*) THERAPEUTICS.—The aim and object of (*A*) and (*B*) is to improve the means of treating disease by medicinal substances and agencies, an object which is dealt with more directly in the word therapeutics. Probably the growing needs of these subjects might have been overtaken without the institution of special new professorships.

A few years ago, when the conditions of tenure of a new Chair of Clinical Medicine were being considered by a Joint Committee of the University Court and the Managers of the Royal Infirmary, a proposal was made, and appeared to meet with approval, to require the occupant of the Chair to devote his whole time to the treatment and teaching and investigation of disease. This proposal, however, was afterwards departed from, and no special conditions were attached to the new Chair excepting a distinctive name and a salary somewhat larger than that of the other professors and senior lecturers in clinical medicine. As originally suggested, the new professor, dealing unavoidably with the treatment of disease, would necessarily have had much of his time, if not the greater part of it, occupied with therapeutics. To supply these unattained requirements, and thereby to provide for the greatest existing want in our system of medical progress and research, it is desirable that a Chair of Applied Therapeutics should now be established, with the following duties and conditions of tenure :—

1. Systematic or didactic instruction on the remedies and remedial measures for treating forms of disease such as pyrexia, inflammation, rheumatism, rheumatic fever, neuralgia, insomnia. This instruction could even now be graphically and vividly imparted by such means as the examination at the bedside of the patient, before and during and at the termination of the treatment of many diseases, such as those of the heart and blood, and of pneumonia, pleurisy, myxœdema, syphilis, anæmia, and the other diseases above mentioned.

2. Instruction at the bedside on the therapeutic effects of individual remedies or of combinations of them, with explanations of the observed effects, based, as far as possible, on their pharmacological effects.

3. Original observation on new substances or methods of treatment on patients, also based, as far as possible, on their pharmacological effects.

4. If physical therapeutics be not included, probably the systematic lecture part of the course could be overtaken in about twelve lectures, for, of course, the teacher would assume that the students are already acquainted with pharmacology. The professor should take a share in the routine teaching of clinical medicine with the other professors and the senior lecturers.

5. In addition to routine bedside instruction, the Professor of Therapeutics should engage in original investigations relating to the treatment of disease, and in their superintendence and direction by others.

For these purposes he should be provided not only with patients but also with assistants, laboratory accommodation, and the newer instruments required in the modern methods of advancing knowledge of the abnormal conditions of patients and the effects of treatment.

These duties would involve the expenditure of much time, and should, indeed, occupy the chief thoughts and interests and ambitions of the Professor of Therapeutics.

6. If this be admitted and considered desirable, private practice should not be engaged in, nor any outside professional or non-professional work requiring more than a trivial expenditure of time during

academic hours. On appointment, the professor should be a man of from 30 to 40 years of age, and should receive a salary of at least £1000 a year.

7. The subject of the professorship should be taught in the final year of study and should be examined on at the Final Professional Examination.

8. Much care would be required to find a man with the requisite scientific and clinical training; knowledge of pharmacology, chemistry and pathology, beyond that usually possessed by undergraduates in medicine; originality of outlook; and power of inspiring others. To obtain a man with these qualifications would probably be attended with exceptional difficulties during the continuance of the war.

(The substance of the above memorandum was submitted to the Faculty of Medicine on the 6th of December 1917, and subsequently to the members of the University Court. These three departments ((*A*), (*B*), and (*C*)) constitute a school of materia medica and therapeutics. Advantage would be derived were it possible to appoint the holder of (*B*) or (*C*) a director of the school. I fear this cannot at present be accomplished. In any event, it is hoped that the harmony of objects will lead to co-operation in work so that a substance found by pharmacology to possess probable therapeutic value may in patients be investigated by the Professor of Therapeutics; while pharmacological incompleteness and doubts may be referred by him to the Professor of Pharmacology for further examination and solution.)

XVII.—THE TEACHING OF MATERIA MEDICA AND THERAPEUTICS.

By Professor C. R. MARSHALL, University of St. Andrews.

The knowledge of remedial measures required by medical students should be limited to that which is likely to be of service in the treatment of disease. As regards drugs, the student should know (1) their names and the forms in which they may be administered, and as much of their physical and chemical characters as is necessary to employ them with advantage; (2) their action, and, as far as possible, their mode of action on healthy and diseased tissues and on the causal factors of disease; (3) the diseases and pathological conditions in which experience and experiment have proved them to be beneficial, and the doses in which they have been found to be of service. He should not be required to learn the sources of drugs, whether chemical or botanical, or the botanical classification and description of crude drugs of vegetable origin. Nor is it necessary that he should be acquainted with those pharmacological actions of individual drugs which have no bearing upon their toxicology or therapeutics.

The appropriate place for materia medica in the present medical curriculum is in the third year of study. The greater part of the course should be devoted to the pharmacological actions of remedies and their bearing on diseased processes, in order to lay a scientific foundation for a rational therapeutics. At this time the student has passed through the courses of chemistry and physiology, which are the corner-stones of pharmacology, and he is presumably studying pathology, which is equally important for an accurate conception of the actions of drugs in their relation to medicine. Indeed, from a pharmacological point of view it is also desirable that pathology, including bacteriology, should precede pharmacology, but as the two subjects can be made mutually helpful, and may, together, be made the foundation for the subsequent years of study, it is more profitable to study them concurrently. These two subjects should afford the main courses of the third year.

Since at this time the student's knowledge of the practical parts of medicine can be only very meagre, it is obviously impossible to teach therapeutics in any comprehensive sense. An enumeration of the diseases for which any particular drug has been given is of little value, and at this stage the teaching of therapeutics should be limited to the principles of treatment and, with few exceptions, to the deductions which can be drawn from the pharmacological action of a drug to its beneficial influence in morbid processes. Similarly, while it is desirable that the non-medicinal measures employed in therapeutics should be briefly described and considered from a physiological point of view, their applications can only be stated in broad outlines. To complete the student's training in therapeutics a briefer supplementary course (or courses) should be given in the final year. It might take the converse form of considering pathological conditions and the best means of combating them. Naturally, most of the student's therapeutic training should be done at the bedside, but in many schools this training seems to be inadequate. It is not sufficient to state that a particular drug or formula is beneficial in a given condition. A reasoned statement of its value, or, in the case of a combination of remedies, of the value of the individual components, should be offered, and the student taught to watch the effect of the treatment on the course of the disease. Brief courses of a few lectures on dietetics, climatology, and non-medicinal methods in general, as far as possible with demonstrations, should be given at this stage.

In short, the training of the medical student in materia medica and therapeutics should be as utilitarian as is possible with the laying of a scientific basis for the eventual treatment of disease. He should, however, be taught current opinion on the mode of action of drugs in general, and principles such as underlie the relation between chemical constitution and pharmacological action, in order that he may be able to discriminate between the probably good and the probably bad remedies in the specious advertisements of the day. But pharmacology as a branch of biology cannot receive adequate treatment in the ordinary medical curriculum without unduly encroaching on other subjects, and as it is very desirable for many reasons that it should be taught, it might well be included as a subject for the degrees in science.

XVIII.—TEACHING: WITH SPECIAL REFERENCE TO MATERIA MEDICA.

By WILLIAM C. SILLAR, Lecturer on Experimental Pharmacology,
University of Edinburgh.

THE word teaching has been chosen as the title of this contribution to the discussion on medical education, because the determination of principles must precede the arrangement of details; and the adjustment of the latter is a less arduous task when the former meets with general agreement. What measure of agreement, then, exists with regard to the answers which ought to be given to the three questions—First, What is teaching? second, Is it an important function in the University? and third, To what extent does it exist to-day in our medical curriculum?

To the first question, concerning the nature of teaching, we may say that the imparting, not of information, but of instruction, is the essence of teaching, and that this imparting of instruction is education or the development of certain powers of the mind of the taught. The powers which, during the medical curriculum, require most particularly to be developed, or produced if they are not already in existence, are (*a*) the power of orderly arrangement of the facts which are being acquired (which facts, by the way, should be supplied in the text-book written by the teacher); (*b*) the sense of proportion whereby the more important can be discriminated from the less important, which sense is most readily inculcated by means of the lecture; (*c*) the power of observing with attention things and processes; and (*d*) the power of recording the results of these observations in accurate language, and pictorially or graphically where these methods are possible. The instruments for the two last are the practical and tutorial classes.

To the second question, regarding the importance of teaching, my answer would be that it is impossible to exaggerate its importance; and to the third question, dealing with the present-day existence of the function in the medical curriculum, I suggest, with the expectation of indignant denials, that it is very little in evidence.

Thus the text-book (not a work of reference) with those facts and explanations which alone are to be permanently remembered is not yet issued to every class so as to obviate the distracting exercise of excessive note-taking. The lecture is still given to all, irrespective of individual capacity and attainment, and even the practical class is attended by those who do not understand why they are performing the tasks allotted to them, and believe that their time is being wasted by the unnecessary repetition of unnecessary and non-educational processes.

The possession of a good foundation is an advantage when we wish to erect with confidence and certainty an edifice which shall be stable, and to which can be added superstructures; but our experience is that the foundation has not been well and truly laid, and any proposal to lighten the superstructure by placing some of it among the foundations appears to be an imperfect method of meeting a difficulty; or, if we use a figure which has been frequently employed, and discuss the problem of pouring a quart of fluid into a pint bottle, the problem is not solved satisfactorily by boring a hole in the bottom of the bottle, although, no doubt, to the superficial observer there will be all the appearance of the reception of the extra fluid. A more reasonable remedy is to organise an alternative, voluntary, lengthened curriculum.

The foundation, laid at school, which we require is twofold: first, a command of, and thorough understanding of, the meaning of language, and secondly, an appreciation of what is meant by accuracy and measurement. The subjects of English, Latin, and mathematics appear to be more suitable instruments for these purposes than the principles of biology and chemistry.

On this foundation should be built, in order to train the mind in the ideas of combination and dissociation of elements, correlation of organised structure, and life itself, the subjects of the first year, with frequent exercises in description of things observed and experiments involving weighing and measuring. The student should be by this equipped for the study of anatomy, physiology, and materia medica. But at present he unfortunately arrives at that stage accustomed to the conception that 30 per cent. of knowledge is a satisfactory standard, and that 50 per cent. confers distinction.

This suggests a digression in order to appreciate the value of the class examination as an instrument for teaching, and I hold that this essential appliance is badly misused. The element of competition is quite unnecessarily introduced, adding to the labour of the teacher without corresponding advantage to the student, and the test has become much more a test of power of memory than a test of power of understanding. The numbers of these tests are too few; each should be limited to a single problem; during them the student should be allowed access to his books and notes; and the teacher should discuss with those individuals who obviously require it those answers which are imperfect.

It would, indeed, be preferable to call them class exercises, in order to counteract the pernicious idea that every question is a skilfully constructed trap for the unwary. An exercise designed for testing information which has been committed to memory, such as, for example, dosage, should demand a standard of 100 per cent., and should be considered a bad test if the majority of candidates do not attain to a 75 per cent. standard. If it is said that this ideal is one which is impossible of attainment, the answer must be made that one of the requirements for successful teaching is the preliminary assortment of students into groups of approximately equal capacity. This has not been attempted, and is one of the reasons why the method of imparting instruction by means of the systematic lecture alone, or mainly, has so long persisted.

As materia medica consists of the knowledge of the properties of medicinal substances—physical, chemical, pharmacological, and therapeutic—and the methods of their employment (prescription-writing), there is evident convenience in studying the subject in the above order. But as the prescription is the obvious end and aim of the study, there is the advantage to be gained when prescription-writing is studied at an early period of the curriculum, of fixing the student's attention on the purport of his studies.

There seems to be no reason, then, why pharmacognosy, pharmacy, and elementary prescription-writing should not be studied along with anatomy and physiology, always providing that the less capable student, who cannot spare any time from the study of the two greater subjects, should not be allowed (after consultation between the various teachers) to embark on this additional study, and that he is under the supervision of the anatomist and physiologist for the whole of his time.

The study of prescribing and prescription-writing is of too great importance to be inadequately taught; and the comparative neglect of it in the past has acted to the detriment of the medical and pharmaceutical professions, and of the general public.

Pharmacology alone, without pharmacognosy on the one hand and therapeutic applications on the other, should not unduly add to the labours of the third year; and some of those facts which can be demonstrated experimentally should be shown to those who could appreciate them. It is worthy of consideration, moreover, whether it would not be to the advantage of the more capable student to arrange for him to perform certain pharmacological experiments in order to educate him further along the lines of observation, recording with accuracy and drawing legitimate inferences.

Therapeutics should then be studied after a knowledge of diseased conditions has been acquired, and studied systematically by the bedside, and during this period there should be further exercises in prescribing along more advanced lines, where, again, the teachers who had laid the foundation should come in contact with the results of the teaching, to the great advantage of both teacher and taught. The power of prescribing would thus be more thoroughly tested than can be the case where a candidate for the final examination prescribes only for one or two clinical cases which are allotted to him.

There is no doubt that these requirements necessitate a largely increased staff, and there is nothing to be gained by concealing these necessities, and thus perpetuating a thoroughly unsatisfactory state of education. Were these requirements met, there could be established a pharmacological school which might be trusted to add to the reputation of our university.

XIX.—THE TEACHING OF MATERIA MEDICA.

By Professor RALPH STOCKMAN, University of Glasgow.

At a remote period in the history of cultured peoples a knowledge of materia medica constituted almost the whole sum of their practice and science of medicine. At the present time the term, in our Scottish schools of medicine at least, has come to be merely a conventional and brief name to denote a number of closely allied and interdependent branches of medicine. It is this which has introduced so many difficulties into the teaching. The teacher has to deal with pharmacognosy, pharmacy, prescribing, pharmacology, and therapeutics, and the last involves a certain amount of pathology and clinical medicine, not always of an elementary kind. One cannot teach therapeutics without trenching on these, and it is to be borne in mind that the subject includes not only the remedial action of drugs, but such measures as vaccine and serum therapy, massage, electricity, diet, climate, spas, and mechanotherapy. The different parts of the subject demand very different degrees of medical training and maturity on the part of the student. For instance, pharmacognosy, pharmacy, and prescription-writing are requisite at an early period of the curriculum; they can easily be learned then, and require very little previous knowledge for their study. A certain limited acquaintance with these subjects is absolutely necessary for the student and practitioner of medicine, but it could quite well be imparted in a short special course by a teacher who has been trained as a chemist and druggist. The most important point, in my opinion, is to settle whether the teacher is to be a pharmacologist with no pretensions to clinical knowledge and practice, or whether he is to be a physician who has had a special training in pharmacology and therapeutics. After a pretty long experience in teaching medical students I have no hesitation about deciding in favour of the latter. A pharmacologist working in a laboratory as his sole professional occupation soon loses touch with practical therapeutics. What he has to teach is of little interest and importance to medical students or practitioners. Many such pharmacologists have been distinguished physiologists and physiological chemists, but their contributions to therapeutics or practical medicine have been singularly few and unimportant. Their work has mostly been explanatory of the known actions of old and tried remedies, or has systematised and extended our outlook on groups of remedies. Ehrlich may, I know, be cited as a striking example to the contrary, but the chemical part of Ehrlich's researches on organic arsenic compounds was carried out by a combination of chemists of great experience and ability. It is unlikely that it would be possible to obtain a teacher of pharmacology with sufficient chemical knowledge and skill to repeat or carry on similar researches. Speaking broadly, it seems to me that therapeutics can only be profitably studied on persons who are ill, and hence the teacher should have as wide an experience of this kind as possible. The teaching of a man who is merely a laboratory pharmacologist will lack conviction and real knowledge. The value of such drugs as iron, arsenic, mercury, quinine, salicylic acid, potassium iodide, emetin, and many others, can only be established in diseased conditions. Their action on healthy men or animals gives no clue whatever to their action in the diseases for which they are all valuable remedies. It is notorious that the laboratory studies of the action of digitalis have misled us as to its true action and its application in treating heart affections. A physician who knows the daily requirements of patients and practitioners, and who is well acquainted by experience with the shortcomings and value of remedies in their actual use, seems to me the only possible teacher of therapeutics.

The next point is to determine what the student, as a future practitioner, requires from his teacher. This, I think, can be answered very shortly. It is not merely an account of the physiological action of substances used as remedies which is required, but a carefully considered and well-balanced estimate of their value and application in diseased conditions. Pharmacological experiments on animals may or may not throw light on this. In any case they form a subordinate part of the subject, which is essentially a practical one.

I cannot say I am in favour of dividing up the subject and multiplying the number of teachers. Such a procedure leads to too great detail in teaching, and in a five years' course a medical student can only be expected to acquire a very elementary knowledge of any one subject in the curriculum. I do not think there should be a separate course of pharmacology and a separate course of therapeutics. The remedy for the present unsatisfactory position of the teaching of therapeutics would be for the student to start clinical medicine and attendance at lectures on medicine somewhat earlier than at present. He would then be in a better position to understand the meaning and bearing of therapeutical measures. Real practical bedside training in therapeutics is very difficult to carry out. For one thing, and it is a very important point, the clinical material would be usually lacking at the time it was wanted. A little can be done in this way, but it requires years to accumulate gradually the mass of diagrams, tables, photographs, and results generally which are required for teaching therapeutics in a systematic manner, and these could hardly be demonstrated and explained at the bedside.

DISCUSSION.

Professor Gulland.—For a good many years I examined in materia medica, and I made it a rule never to ask anything about the subject that I did not think it necessary to carry about in my own head. I think the main point in materia medica—as in everything else in medicine—is to aim at the selection of the significant and to let the insignificant go.

Dr. John Orr.—Materia medica and a knowledge of drugs is really the stock-in-trade of the future medical practitioner, which he is going to use constantly in his everyday practice. The *Pharmacopœia* is overloaded, and a great number of substances might usefully be eliminated from that volume. It should be revised in a drastic fashion so that remedies which are likely to be employed are given prominence, and some substances which are never used eliminated altogether. Some of the doses given in the *Pharmacopœia* are stated in amounts which would defeat their object by being either far too strong or, if given in the maximal dose suggested, would be too weak for the treatment of certain diseased conditions.

The recognition of the names of the various drugs and their physical properties, their method of being handled by practitioners, and their prescription should be taken at quite an early period in the course, so that the student may be familiar at least with the names of the substances which are to be used in medicine, their dosage, and the way to handle them. The teaching of the action of drugs might come in the fourth year, after the student knows something about physiology, anatomy, and medicine. At present he is taught medicine in the third year and starts at the same time pharmacology and therapeutics. At the beginning he has no notion of the names of the diseases and still less of the ways in which they manifest themselves, and therefore it is incumbent at present on the teacher of materia medica and therapeutics to discuss with him in many cases the salient features of a given disease, so that he may grasp the therapeutic effect. If the teachers of medicine in the third year could shortly allude to various remedies which are used in disease, the student could follow his pharmacological course much better, because he would already be familiar with the names of the drugs. When he comes to his fourth year he already has some knowledge of clinical medicine, of pathology, and of symptomatology, and if he began at this stage to study pharmacology and therapeutics he would get from his teacher much greater enlightenment as to the handling of the various drugs. The study of pharmacology is essential so that a student may understand the action of a drug in health and be in a position to understand how it will work in disease. If more time were available for the teaching of pharmacology, and especially of therapeutics, it would be much easier for the student to derive benefit from his lectures than at present. I should widen the scope of the teaching of therapeutics to include not only the use of drugs, but also the treatment of disease by physical methods, electricity, etc., not forgetting dietetics. The best use can be made of the time the student has for pharmacology and therapeutics by dividing the subject, taking therapeutics, in the very broadest sense, at a later stage, say, in the fourth year. I also agree that the best teacher, making allowance for the needs of the student, would be a man actually engaged in practice—hospital, private, or both.

Dr. Chalmers Watson.—From the clinician's point of view, the first question we have to consider is, "What proportion of the benefit obtained from treatment by medical practitioners is due to the use of drugs employed by them?" I believe that drugs play a comparatively minor *rôle* in treatment. With the exception of a few really valuable drugs, like opium, castor oil, quinine, etc., with known definite pharmacological actions and proved usefulness because of that action, a large part of the benefit obtained from drugs is obtained solely through mental suggestion. The most important therapeutic agents in medical treatment may be shortly summarised as follows:—(1) Drugs administered for the cure of the disease, or for the relief of symptoms. (2) Diet. (3) Treatment by physical methods, including massage and remedial exercises. (4) Treatment by vaccines. (5) Last, but not least, the mental factor in therapeutics—psycho-therapy. The instruction given at present in all of these subjects is seriously inadequate, and great reforms are essential.

I should like a considerable curtailment of the time at present devoted to pharmacology and theoretical therapeutics, and the time thus spared devoted to the teaching of dietetics, the treatment of disease by physical methods on modern lines and with efficient equipment, instruction in the principles and practice of vaccine therapy, and the use of psycho-therapeutic methods, the teaching throughout being made as direct and practical as possible. We must get back to the fundamental point, that it is not so much a change of system as the adoption of a wider outlook by the individual teacher and the cultivation of a spirit of investigation on the part of the clinician that is required.

Dr. J. S. Fraser asked if there is any great point in teaching students how to make pills, suppositories, and plasters. He also entered a plea for more detailed teaching of methods of treatment at the bedside in hospital.

Captain Frank Fraser, R.A.M.C.—As I have but recently begun to teach, the difficulties a beginner feels are fresh in my mind. For example, one teaches the students with some degree of confidence a disease process, and what stage of that disease the patient before them is in. Then one tries to teach them the treatment—equally logically: one is beaten at once. We have never been taught what drugs or other methods of treatment are to be used in any particular stage of a disease. We should be able to class treatment under various heads. We should be able to say that this or that method will check or cure the disease, that this other will only enable the man to get through the world and to carry on his work more or less satisfactorily. When the student asks you, "How do you *know* this or that?" the only reply usually possible is, that our treatment depends upon the experience of our forefathers, and is founded on impressions. Only in a very few cases can we give the student definite reasons and facts for using a particular treatment at a particular time. Professor Stockman mentioned this in speaking about digitalis. Even when I was a student digitalis therapy rested on pharmacology, or upon the clinical experience that in certain types of heart disease which were not well understood digitalis operated beneficially. It was left to Sir James Mackenzie to analyse the different types of heart disease and to show when digitalis will be of use and when it will not be of use. Even in the short time that I have been in hospital practice there are few methods of treatment in which our knowledge has made such strides as in digitalis therapy. If we are going to teach our students as widely as we can what disease is and how to recognise it in its different stages, we must also in its treatment know what to do and why to do it. For that reason the bedside is so essential. If you try to found your treatment on pharmacology you are lost; if on your forefathers' knowledge, you feel you have not really got enough to go upon. Whether Professor Stockman meant as much as he said I do not know, but I was very glad to hear him put pharmacology, materia medica, and pharmacognosy rather to one side. In these subjects we should aim at giving the student the main features of what he will have to practise, and devote as much time as possible to therapy at the bedside; and we must more and more try to teach him *what* and *when* to do.

Dr. Ker.—Professor Stockman tells us that the student is being taught too much. That is the conclusion some of us have come to already who have followed this discussion from the beginning. We are trying to put too much into the student; his power of assimilation is, after all, distinctly limited, and guiding his reading rather than making him learn so much by heart would be much more valuable to him. Certain parts of every subject, of course, have to be studied very completely, and obviously the duty of the teacher is to settle for himself what those parts of his subject are. It would be a good thing if some method could be devised whereby a student, although taken over a great part of the ground he covers already, would not be examined on the whole of it, but would rather be taught how to look up information than to trust entirely to his memory. Under this system, of course, a very high standard would be adopted as regards things that he *must* know, things useful in emergencies that he might be confronted with at a moment's notice. By being asked to assimilate a large amount of useless knowledge the student is apt to forget the essentials and to remember much less necessary things. I would like some of these scientific gentlemen in laboratories to try and find out pyschologically how much the student can take in.

Dr. Traquair.—I was interested in Dr. Sillar's reference to examinations. The idea of allowing students to go to text-books and references is an excellent one. The examination should be quite as much a test of how to find out information as of how much the student remembers of what he has learned by heart.

Professor Lorrain Smith.—There is fair unanimity in what has been said to-night as to the necessity for readjusting the present form of teaching, and the only point I would like developed by the speakers when they reply is that they might give the club as far as possible their ideas on *how* the present method of teaching should be readjusted. It is clear that all the teachers in materia medica and therapeutics desire to see the therapeutic side of their teaching carried on at a later period than the study of pharmacology. How is that to be readjusted to the present methods of teaching clinical medicine?

Professor Marshall said in reply.—*The* one point about which I feel strongly is that, as far as the ordinary medical student is concerned, the teaching, whether of materia medica considered as a whole, whether of pharmacognosy, pharmacy, prescription-writing or pharmacology considered individually, should be utilitarian. He requires an impressionistic picture of the pharmacological action of the different drugs, on which he may base their therapeutical applications.

I want to state very definitely, however, that the establishment of a pharmacological school in most of our great universities is also essential, and I would introduce into the science curriculum pharmacology as a subject, where it could be taught in its relationship to biology, chemistry, physics, etc.

Professor Stockman's remarks have been very much to the point, and I agree entirely with him. Most of our practical knowledge of the actions and uses of drugs has been acquired from investigation on man, largely from the trial and error experiment. Even Ehrlich's investigation of the organic arsenical compounds seems to have been suggested by the beneficial effect of atoxyl in disease.

Mention has been made of the *Pharmacopœia*. To a teacher of pharmacology and therapeutics the *Pharmacopœia* is a bugbear. It is not intended, of course, as a text-book for students. It is intended to supply the medical practitioner with the drugs he wants. The Medical Council does not undertake to teach the medical student or the medical practitioner what drugs he shall use. Consequently the *Pharmacopœia* merely defines what the desired drugs are, and as far as possible ensures that they shall be of standard quality. In theory at least it might consist of useless remedies, and in fact it contains much of questionable value. It consequently tends to establish a vicious cycle.

With regard to prescribing. One of the speakers asked what was the use of teaching students how to make pills and suppositories and so on. It is done to teach them, in the only efficient way, the forms in which drugs may be administered, and this is one of the necessary things in therapeutics. The student, when he becomes a practitioner, should be able to prescribe any drug he chooses in the most effective form and thus use it to the best advantage.

As regards the time that should be spent over materia medica, the essentials to be taught depend so much upon the individual teacher that it is very difficult to lay down any hard-and-fast rules. Personally, I would prefer to have a short course of pharmacy and pharmacognosy in, say, the second summer, followed by a systematic course of pharmacology and therapeutics in the third year. I think too much pharmacognosy is taught in some schools. It is not necessary for the practice of medicine to know the botanical origin and differentiating characters of, say, the two forms of senna leaves. As far as pharmacology and therapeutics are concerned, I am of opinion that the hundred-lecture system should be reconsidered. For the ordinary medical student seventy-five lectures would, I think, be ample, and they should not be given on consecutive days. One essential thing in the earlier as well as in the later years is to tell the student *how to use* drugs. I could relate instances of the inefficiency of treatment due, not to the choice of the remedy, but to the improper use of it. I should like to see the clinicians alluding more and more to the proper application of remedies in the treatment of disease. I am not in favour of a prolonged course of experimental pharmacology such as is carried out in some of the universities of the United States, at least for the ordinary medical student. The results obtained are not, in my opinion, commensurate with the time expended.

I think, in the majority of cases, therapeutics is not sufficiently taught in the later years of the curriculum. The physician does not base his therapeutic observations to a sufficient extent on the knowledge which has been acquired by the student. He rarely explains *why* such and such a drug or such and such a combination is valuable. In all cases of bedside teaching he should state the prescription he is going to use and his reasons for doing so. The non-medicinal methods are, I think, also better taught in the later years. Before the war I used to have demonstrations of massage, and demonstrations on the use of X-ray and electrical treatment are still given. These things should be demonstrated, talked about, and illustrated as much as possible.

With regard to the professorship of therapeutics referred to by Sir Thomas Fraser, I do not think it is necessary to say much. Professor Stockman has made some very pertinent remarks on what can actually be done in teaching therapeutics practically, and I agree with most of what he has said. I am sure the institution of this Chair will be of benefit, but too much should not be expected from it.

Dr. Sillar said in reply.—Though it has not been said in so many words, I think all the speakers to-night have in essence agreed with every word I said in my paper. Firstly, nobody has attempted to defend our methods of teaching. I expected to find my statement on this point greeted with indignation, but it was greeted instead with what I take to be the silence of agreement.

Secondly, with regard to teaching by an expert. By an expert in teaching pharmacology would, of course, be meant a pharmacologist. Professor Stockman's view was, I think, unduly pessimistic. Very curiously, one suggestion he made as regards the teaching of one part of the subject was to introduce the expert. Why should he think it would be better to teach the medical student the little dispensing he requires from the instruction by a druggist rather than by a practitioner? They look at the matter of prescriptions from diametrically opposed points of view. I strongly object to the idea that the medical student's dispensing would be better taught by a druggist than by a man who understands the problems from the point of view of the practice of medicine.

It has been said that the teaching of the pharmacological action of drugs is practically useless. A great many of the speakers have left entirely out of consideration the fact that pharmacology is a subject in its infancy. Clinical teaching has been in existence for hundreds or thousands of years, and the accurate knowledge of the action of drugs gained in all that time obtained from clinical observation has not been great. It is too soon to judge as to what is going to be the future treatment of disease by medicinal substances. In the comparatively short time—about fifty years—that the pharmacologist has really been at work he has removed about half the substances that were previously being used in the treatment of disease. That is no inconsiderable piece of work to begin with. More and more will the pharmacologist teach clinicians what substances he need not expect to find of any practical use. Within quite recent years we have had practitioners strongly upholding the value of sulphate of lead—an insoluble, unabsorbed substance—as an external application in the treatment of disease. Sarsaparilla not long ago was used as a routine treatment in syphilitic conditions. The pharmacologist has shown that these things are practically useless. Another point may be emphasised in connection with the labours of the pharmacologist, that although the treatment of malaria by quinine was introduced clinically or therapeutically originally, yet the practitioner now has as a scientific instrument in the treatment of malaria a more efficient weapon in his knowledge of the toxic actions of quinine on the parasite. It has always interested me as showing the power of a great mind that Binz, in the days when malaria was looked upon as a nervous disease, from his pharmacological investigations on the action of quinine on protozoa, said, "It will be found in time that malaria is a disease caused by a parasite." In many directions will the accurate observations of the pharmacologist bear fruit in the future.

With regard to Professor Stockman's question as to how many of us have ever given an emetic, I remember one instance when one of my students swallowed one and a half seeds containing croton oil. I administered a draught of warm water and mustard, and demonstrated the action thus practically to him. I do not see why such things should not be taught to the class by illustration on one of the students. In considering the action of purgatives, we want to know when we administer a purgative whether it will cause pain or griping, and within what time it will act. Is there any reason why we should not administer to half a dozen of our class and ask them to report upon the nature and time of the action?

Professor Marshall has put the matter of the *Pharmacopœia* succinctly. It is not a text-book. The question of doses is one for the experience of the individual practitioner.

The reason why we ask the men to make pills or suppositories or ointments is because it is the quickest and least wearisome method of impressing upon them the essential characters of these particular preparations, and to avoid the alternative of having to talk to them at length on these matters. It is the most practical method of teaching them what it is essential they should know.

With regard to pharmacognosy. Our teaching of the *Pharmacopœia* nowadays is cut down to a number of substances sufficient to develop the power of observation in the student. One would prefer, of course, to teach him generally how to observe by showing him half a dozen cases of different degrees of, say, cyanosis at the same time. He would examine other patients side by side, and observe the different odours in their breath. But to get such a selection of patients whenever they are wanted is, of course, impossible. And yet it is to be desired that the student will be trained to detect the odour of acetone in the breath, the colour of the lips, and so on, by a cursory glance. The whole educational object of studying pharmacognosy is to learn to observe minutely and to describe accurately. If we wish to teach the student the value of absorptive bases to be absorbed through the skin, he must have a practical acquaintance with the different materials—paraffins and fats. I was extremely gratified to see Sir Thomas Fraser's remark on prescription-writing, because, though I myself feel that prescription-writing at present leaves much to be desired, I do think it is very much better than it was before we co-ordinated our teaching to this end. It is only the experience gained in teaching that gives one that sense of proportion which enables one to instil into the mind of the student the necessity of his laying stress upon what is important and of discarding what is not important.

Professor Stockman said in reply.—I think the defects would be largely removed from the teaching of pharmacology and therapeutics by making the student study medicine synchronously with them. A little knowledge of medicine would enable him to pick up many points in therapeutics which he would otherwise probably miss. The trouble lies in therapeutics being taken too early in the course. When a student knows nothing about medicine and the practice of medicine, it is very difficult to teach him anything about therapeutics. The men know neither pathology nor clinical medicine when they come to me, so that it is a very difficult matter to teach them therapeutics. I do not agree with Dr. Sillar that the subject is badly taught in medical schools. I think it is very well taught on the whole, in spite of the extreme difficulties, confirmed by Dr. Marshall. It is undoubtedly a subject that *cannot* be demonstrated systematically for teaching purposes on patients. I have tried, every teacher has tried, but from natural causes it is impossible, except in a very occasional and small way.

What I said about pharmacology referred only to pharmacology for the medical student, and not to the higher study of the subject, for I understood the scope of the discussion to have relation only to the teaching of the medical student. To have "a school of pharmacology" in the university would need a large staff and a much more elaborate organisation than at present, but the medical student can be far better taught all he requires by one man than by five.

We must remember that about two-thirds of the enormous amount of knowledge that a medical man has to carry about with him is weariness to the spirit. Although each department of medicine may in itself be extremely interesting, the details of all are intolerably wearisome, and must remain so. They do not stimulate the mind, they are merely efforts of memory, and that is why so many doctors are uninteresting in conversation and outlook—the stifling effects of the details of the curriculum have dulled them. It is certainly very desirable that teachers as a body should give their most earnest consideration to reducing mere details of instruction to a minimum. I am aware they cannot be wholly eliminated, but it should be borne in mind that the student is not being educated as a specialist in any one department of medicine.

The relative usefulness of drugs and other agencies does not, I think, come into this discussion. Personally, I teach physical therapeutics, and I do not think a special teacher is urgently required for medical students in this branch, except in electricity.

XX.—MEMORANDUM ON THE TEACHING OF "PUBLIC HEALTH" (?) IN THE CURRICULUM OF MEDICAL STUDENTS.

By JOHN ROBERTSON, Medical Officer of Health, Birmingham.

THE vast majority of medical students pass on to general practice or to specialised practice as surgeons, physicians, etc., and seldom have to deal with the specialised functions which have now come to be recognised as those of the medical man who deals with Public Health.

I would, therefore, like to abolish the title of "Public Health" as the name to be given to any course intended for the ordinary medical student. In its place I would substitute a course which might be called "Preventive Medicine," and which, while dealing with some of the ground covered in the present Public Health course, would deal more specifically with the prevention of disease as met with in the ordinary practice of a medical man and as needed in the interests of the community at the present time. I would, however, retain the title and scope of the present Public Health course for those who intend to qualify in Public Health as a profession.

In my ordinary work as a medical officer of health, and since the war commenced as a member of the Army Sanitary Committee, I have been brought a great deal into contact with medical colleagues who have been engaged in general practice, and who have been transferred to positions requiring knowledge of what I call Public Health problems. I have been surprised at the few of these who have been able to deal with such questions as water supplies, sewage disposal, soils, sanitary fittings, etc., etc. They have gone through the ordinary Public Health course, but obviously it is entirely inadequate to enable anybody to express an opinion on a water supply, or a sewage works, etc.

On the other hand, there is no group of men who have the opportunities of the general medical practitioner for dealing with individuals who require advice on the methods of prevention of the spread of disease. In my opinion there is a vast field of work at present almost untouched in the domain of the prevention of disease. Largely this is a personal matter, requiring the personal instruction which can be better given by the private medical attendant than by anybody else, and I feel very strongly that the duty should be cast upon the private medical attendant to a much larger degree than at present of dealing with prevention as well as the cure of disease.

We are at present too apt to think of prevention as applicable only to the so-called infective diseases. As a matter of fact there are very few diseases in regard to which preventive measures cannot effectively be taken. It may be said that all these problems are dealt with in the other courses which a medical student has to attend. As a general rule, I would say that this is not the case, because there is so much to get in for examination purposes in the etiology, diagnosis, and cure of diseases that it is impossible for the teachers of these other subjects to deal effectively with prevention; and I feel that if a course were given on prevention it would draw the attention of the profession to its duty in this connection.

Few, for instance, of the medical schools have lectureships on tuberculosis. In a large number of the medical schools diagnosis and treatment are well done, but the teaching of methods of prevention of such a disease may or may not be.

A very large scope for prevention at present exists in regard to antenatal and early infant mortality, and so on—one might go through nearly the whole number of diseases dealt with in the ordinary medical course from their preventive point of view.

I believe there is enough to be done in a course of preventive medicine without trenching on the functions of the Professor of Medicine, or the Professor of Bacteriology, or anybody else. Many of the conditions causing illness and death are not dealt with in the present courses. For instance, the diseases which bring on premature old age are very important, and, similarly, those of dietetic origin.

If I am not mistaken, the National Insurance Act will demand that the panel doctor in future shall, as a part of his functions, advise as to means of prevention. The Act of Parliament is entitled "An Act to provide for Insurance against Loss of Health and for the Prevention and Cure of Sickness," and it is only a matter of time before these requirements will be put in operation.

It cannot be too often impressed upon the profession that the prevention of disease is much more important than the cure of it, and this idea ought to be impressed on the medical student.

XXI.—THE TEACHING OF PUBLIC HEALTH.

By Professor MATTHEW HAY, University of Aberdeen.

As a special post-graduate curriculum of training in Public Health is now almost everywhere provided for students aiming at an appointment in the Public Health Service, the course in Hygiene or Public Health for students proceeding to the ordinary medical degrees should be confined to the requirements of the ordinary medical practitioner, who is expected nowadays, more than ever, to have an intelligent understanding of the principles of preventive medicine and to be able to co-operate effectively with the health authorities in all measures for the prevention of disease. The practitioner is still too largely regarded by his patients, and, I am afraid, also not infrequently by himself, as being concerned only with the treatment of disease. As an advocate of a system of Public or State Medical Service, I believe that we are not likely to attain a proper combination of the two functions in the practitioner until such a system is established; nor, I think, until then are we likely to secure quickly that scientific study of early symptoms which my friend and old fellow-student, Sir James Mackenzie, so cogently advocates.

The requirements of the practitioner in respect of hygienic instruction must include primarily full attention to all matters relating to personal and domestic hygiene, and, perhaps, to a lesser extent, to industrial hygiene, which is largely in the hands of specialists, although it is not without considerable practical value to the ordinary practitioner. Much of the elaboration that is necessary for health officers in regard to such subjects as water-supply, drainage, and sewerage can safely be omitted, especially on the engineering side, and to a considerable extent also on the chemical side.

The important subject of food and feeding is a part of the question of personal hygiene. Here, as in several other subjects usually embraced in a course in Public Health, it is very desirable that, in order to avoid overlapping, or, what is worse, to prevent lacunæ in instruction, by one lecturer trusting to another lecturer to overtake certain parts of a subject, there should be some considered arrangement between lecturers as to what parts each is to teach. Thus in regard to food much of the field may or may not have been covered by the physiologist, or possibly by the therapeutist or clinician. I am afraid many of us would have to plead guilty to failure in adequate consultation with our fellow lecturers. I suppose that Boards of Studies which came into Scottish university legislation for the first time in the ordinances under the Act of 1889 were intended, in part, to assist in such a matter, but I doubt if in almost any of the universities—I am thinking especially of the Medical Faculty—much effective use is made of these Boards in securing a periodical survey of the ground covered. At the present time, when much is being said regarding infant feeding, I have heard more than one practitioner from different medical schools say that they had had practically no instruction in it. The physiologist, the obstetrician, and the hygienist have each some responsibility. With this and some other not unimportant matters of medical instruction it is an almost literal dropping of them between two or three stools, or shall we say chairs. The care of the teeth is another of the subjects of everyday importance, regarding which practitioners sometimes make similar remarks.

A necessarily important and emphasised subject in every course of hygiene for medical students is the etiology of infectious diseases. their methods of transmission, and the means for their prevention. Here, again, there is obviously opportunity for overlapping between the hygienist and the lecturer in medicine. The field of the lecturer in medicine is so enormous, and his opportunity of seeing cases of the more common infectious diseases has in recent years become so diminished by the removal of nearly all such cases to the isolation hospitals of local authorities, that the question is raised whether these diseases, or an agreed-upon portion of them, should not be more definitely detached from the ordinary course in medicine, and form a separate lecture course, with a fuller treatment of them than is possible in the existing short course at the fever hospitals. This is now the more necessary, as, except for the surgical cases, cases of tuberculosis are now almost altogether excluded from the general infirmaries. But such detachment would still require that consideration should be given to what should be taught in the hygienic course and what in the special course.

Among other subjects requiring attention in a Public Health course is vital statistics, in which some knowledge of the leading facts, as also an intelligent conception of statistical values, is desirable for the medical practitioner. Four or five lectures may sufficiently cover the ground. It is necessary also that practitioners should know something of sanitary law in relation not only to themselves or their patients, but also to broad questions of health policy. It would be a distinct advantage to the general welfare of the community if medical practitioners as a whole could have their interest more fully awakened in sociological problems of a hygienic kind. Medical practitioners have both opportunity and influence in directing and shaping public opinion.

So far as concerns the distribution of the course in Public Health in respect of lectures, laboratory work, and sanitary visitations, it would be easy to draw up an attractive syllabus of laboratory work; but if the course is not to extend beyond its present limit of about fifty lectures—which is, I think, sufficient, in view of the more special and elaborated instruction for expectant officers of health—very little laboratory work can be arranged for. The previous laboratory work of the student in the bacteriological and chemical laboratories of his medical school should have given him nearly all that could appropriately be taught to the intending practitioner. By the time the student reaches the Public Health class he should have already acquired a considerable amount of experience in the manipulative discipline which laboratory work affords, and of the things which laboratory work demonstrates. He has now reached the stage when the main value to him of further laboratory training is to enable him to carry through the particular examination or analysis with such precision as to give himself and others confidence in the results. Unfortunately, a great deal of laboratory work falls short of this, partly because the object sometimes of the teacher is primarily demonstrative, and partly because the time is inadequate to allow of the complete attention to details, and of the repetitions that are required to ensure some degree of mastery of the methods. When definite and important action may have to follow on the result, accuracy and reliability are necessary. If, for example, the discharge of a typhoid patient from isolation is to depend on the proved and continued absence of the bacillus from the excreta, or if the selection or rejection of a water for potable purposes is to depend on the absence or presence of certain organisms, the practitioner, if he undertakes such examinations, must be certain of his results, or they may be worse than worthless. In regard to practical teaching generally, but especially in the later stages of the medical curriculum, I think that extensiveness could often with advantage be sacrificed for intensiveness. A degree of mastery within a limited range is, in my opinion, preferable to a wider range without any real mastery, and is a better basis for the work both of a common practitioner and of the aspiring scientific specialist. There are a few simple things that might be taught usefully in a laboratory to hygienic students, and which probably have not been taught in preceding practical courses, but whatever is taught in the laboratory should, as I have already said, be less for demonstrative purposes than for actual application and use in connection with medical practice, whether institutional or domiciliary, and be such as may on occasion be really required. In Aberdeen we have not at present any practical class for this purpose, although some twenty-five to thirty years ago, before the special teaching for health officers had been organised, we had a practical class for hygiene and forensic medicine, which was well attended, but at that time attendance on this class counted for the Diploma in Public Health. Forensic medicine and Public Health were then, and for many years subsequently, taught in one course. Now in Aberdeen, as in most other medical schools, they are most properly taught separately and by separate teachers.

Sanitary visitations, as an adjunct to Public Health lectures to medical students, are more easily arranged for than laboratory work, and may be distinctly instructive, such as visits to dairies, bakeries, and other works engaged in food preparation; to different types of housing; to examples of healthy and unhealthy industries; to schools and hospitals in regard to hygienic points in construction, ventilation, etc. Such visitations are included in the present course in Public Health in Aberdeen.

The only remaining point on which I am expected to express an opinion is the position of the Public Health class in the medical curriculum. Logically it ought, like the class of forensic medicine, to come at the very end. For their full exposition, both subjects have to build on nearly all the other subjects. But the last year of the medical curriculum is presumed to be wholly devoted to clinical teaching, and we all know that, even if this presumption were loyally acted upon, there would not be reasonable room for the ever-increasing multiplicity of clinical departments. So, as with several other subjects, a compromise in respect of what may be called ulteriority has to be accepted. It is curious that the struggle or manœuvring for position in the medical curriculum is mostly for ulteriority and not for priority. The study of Public Health ought to follow at least the study of pathology, and, of course, physiology, and we aim at this sequence in Aberdeen, as the prescribed curriculum shows. But we allow the examination in Public Health to be taken at the same time as the examination in pathology, if the student so desires, but it ought not to be so taken if pathology has been passed at the normal period, namely, at the end of the third year. Public Health is studied in the first term of the fourth year—the presumed last year for classes other than clinical classes. The senatus impose the condition that a student will not be allowed to pass in Public Health if he has not previously or simultaneously passed in the other subjects of the group, barring forensic medicine. It would be better if Public Health and forensic medicine were to be taken in the summer following the fourth winter, and a proportion of the students take forensic medicine in this summer and Public Health in the first term of the fifth winter, but I have already referred to the difficulty of the fifth winter. The fourth summer is also very full of clinical specialties, more particularly, it may be, in Aberdeen than in Edinburgh, as in Aberdeen a student who begins his curriculum in summer, as many do, can take his final examination at the close of his fifth winter. These difficulties lead to the question so often discussed, as to whether the subjects of the present first year of the medical curriculum, excepting anatomy, are to be relegated to a sort of preparatory curriculum, whether in or outside the university, or whether a sixth year is to be added to the curriculum.

XXII.—THE PLACE OF PUBLIC HEALTH IN THE MEDICAL CURRICULUM.

By Professor HUNTER STEWART, University of Edinburgh.

In discussing this subject, help may be got in recalling the work done by medical practitioners on the etiology of disease and the methods of prevention. Without going into detail on a matter well known to all conversant with the subject, some outstanding examples suggest themselves. The discovery of the great preventive measure in smallpox —vaccination—was made by Jenner in the course of his work as a medical practitioner, based on observations made in the ordinary routine of practice, and very shortly after that discovery a number of medical practitioners in Edinburgh were the first to provide free vaccination to the poor. The laborious work of another medical practitioner, Dr. Turner Thackrah of Leeds (1831), on the *Diseases of Occupation, their Causes and Prevention*, was the first to focus attention on this subject as it affected this country, and of which Sir John Simon in his *English Sanitary Institutions* says, "Not under any official obligation nor with any subvention from Government, but as his own free gift to a public cause . . . he made it a matter of common knowledge and of State responsibility that in certain of our chief industries special influences, often of a removable kind, are apt to be associated, which, if permitted to remain, give painful diseases and premature disablement or death to the employed persons." Twenty years later, and as a result of observation of cases occurring in their practices, Dr. Snow and Dr. Budd were probably the first to show, at all events in this country, that drinking water polluted with bowel discharges from cases of cholera and of enteric fever was an important means of spread of these diseases, and they thus gave a great impulse to measures for the protection of drinking water from fæcal contamination, and to the adoption of efficient methods of removal and disposal of sewage. Pioneer work on the effects of overcrowding and of impurities in the air of occupied dwellings, as causing and spreading diseases, *e.g.* typhus fever, tuberculosis of the lungs, etc., might be referred to, but sufficient has been said to show the part taken in the past by the medical practitioner in preventive medicine.

Later, and largely as a result of this work, Government and Municipal Authorities took up the matter of administrative hygiene, and the need for special medical officers was recognised and their appointment required by the Public Health Acts, 1872 and 1875. In connection with this it is interesting to note that in 1874 Mr. Lyon Playfair (later Lord Playfair), a former Professor of Chemistry in the university, and then its representative in Parliament, and who had long taken a practical interest in hygienic questions, suggested to the university the importance of providing a special training and a qualification in Public Health for graduates in medicine who had such appointments in view. The degree of B.Sc. in Public Health was established in 1874, and was first conferred in 1875.

Though the great advance in Public Health administrative work of recent times, and much of the research in connection with the causes and means of prevention of disease, is due to the Public Health Service, central and local, the importance of the work by the medical practitioner remains. It will be readily admitted that in his practice he has an opportunity, possessed by no other, of observing the effect of conditions inimical to health, and of showing his patients how these conditions can be prevented. To him his patients must look for guidance and instruction in individual and private hygiene. Some of the recent advances in public hygiene, indeed, *e.g.* child welfare and maternity schemes, prevention of venereal disease, etc., are due, in the first instance, to pioneer work by men in private practice. The aim of teaching the science of Public Health to students of medicine should be to fit him for carrying out this part of his work, and also to form an introduction to its more advanced study should he elect after graduation to take a special qualification in the subject.

The course in the medical curriculum in the University of Edinburgh is broadly as follows:—There are thirty-five to forty lectures, illustrated as far as possible by experiment, six lecture demonstrations, and four laboratory demonstrations. These latter are chiefly microscopical, and are personally superintended by the senior assistant in the department, and by another, sometimes by myself. I find it most important to have this personal superintendence to ensure that the student really sees and understands what he has seen, and what it is meant to teach. The first part of the course is taken up with elementary vital statistics, including estimation of population, birth-rates, death-rates at all ages and at different periods, but especially from 0 to 5 years of age; zymotic rates; certification of the cause of death. Then follows a study of the causes, the means of spread and methods of prevention of the notifiable diseases, etc.; duties of the medical practitioner as to notification of infectious diseases; case mortality of these diseases—how affected by sex, age, and environment of the patient; preventive vaccination, especially in smallpox; Vaccination Act; disinfection of rooms, clothing, and discharges from the sick. The statistics discussed are intended to teach accuracy in expressing the effect of these conditions, as well as of the preventive measures and of treatment. The meteorological factors of climate and how these are observed; the influence of pressure, moisture, temperature and winds, as illustrated by sea, land, mountain, and tropical climates; health precautions in mountain sanatoria. The dwelling—site and exposure; dampness of dwellings; cleanliness of and in the dwelling; sanitary arrangements; the source of impurities, gaseous and suspended, in the air of occupied rooms, and their effect on health; diseases caused or spread by overcrowding; cubic space and ventilation; personal hygiene—baths, suitability of clothing, etc. Duties of the medical practitioner under the National Insurance Act. School hygiene—sanitary requirements, cubic space, and ventilation; prevention of spread of infectious diseases in schools. Occupational mortality; dangerous trades; notification under the Factories Act of certain diseases; causes of these, and their prophylaxis. Water-supply, sources, filtration; diseases spread by water; characters of a good drinking water; interpretation of the analysis of drinking water. Foods; milk; composition of human and cows' milk; risks of contamination from cowhouse to consumer; bacteriological condition of milk as supplied to consumers; pathogenic organisms in milk; effect of Pasteurisation and boiling on these, on the non-pathogenic organisms, and on the constituents of milk; infant feeding. Child Welfare schemes. Preserved foods and food poisoning. Sanitary disposal of the dead.

Some development of the teaching should, I think, be made. A short course of instruction on the Medical Inspection of School Children would be valuable. Further, though Edinburgh is not at present the centre of an industrial area, it will probably become so, and facilities be got for extended and more practical instruction on the causes and means of prevention of industrial diseases. As Public Health administrative work develops it is, I think, important that the instruction of students of medicine should develop along the same lines so as to enable the practitioner to take his legitimate part in protecting the health of his patients, and thus work hand in hand with the Public Health authorities.

DISCUSSION.

Dr. Leslie Mackenzie.—In the papers read to-night nearly all the points that want elucidation have been put before us, but perhaps I might indicate to you what in my own experience I have found to be the most striking gaps in the education of the medical student, not only as regards the Diploma of Public Health—a subject by itself—but also as regards what minimum of Public Health should be required of students of medicine proper. My experience of the general medical practitioner—fairly continuous for twenty-five years in both county and town work over Scotland—is that scarcely ever do you find a man who has got into the habit of looking at things from the administrative side; the normal attitude of the medical man is primarily clinical. Not only that: his clinical insight is limited to cases of gross disease. In approaching the question of medical inspection of school children, for instance, nothing was more striking than the disgust of many men at having to bother themselves over such a trivial matter. They are not to blame, because their whole training taught them to pay little attention to the things that do not require an actual medical prescription and treatment. The medical inspection of school children has helped the practitioner to a greater insight into preventive medicine, as Dr. Robertson suggests it should be applied.

Another thing I have found very defective: when you ask any man who is not accustomed to write a report on a case—I speak now of poor-law work—you find his conception of putting it before you, with all its relevant details, is very elementary. That is a side of the whole of medicine which I have long thought has been distinctly neglected in the curriculum; there is no class, except, perhaps, that of forensic medicine, in which a man is taught what is wanted even in a death certificate, much less in an official report. There is no administrative medicine taught at all, with the single exception, perhaps, of the formula for certifying lunatics and a few other things outside the immediate course of Public Health.

Both Professor Hay and Professor Hunter Stewart speak of lectures being necessary. For thirty years I have preached against lecturing; I should say that nearly half of the curriculum, in all classes of medicine, is over-lectured. I have found in actual practice that one is far more successful by confining oneself to a much narrower field. My students get data and material of a practical kind, and learn from that inductively. I have tried to follow the same idea in connection with the Hygiene Training Colleges. Instead of merely giving lectures, the doctors were required to produce so many children, and the men in the colleges examined them within the limits of the knowledge required by a school teacher. The result was a transformation in the ideas of the medical men and of the students. The actual amount learned was more limited but much more inductive. I think that the defect in the whole curriculum of Public Health teaching to the medical student is that he is given far too much. Professor Hunter Stewart, for instance, practically gives everything in his ordinary course for undergraduates that would be required by a man taking a Diploma in Public Health. If one tries to cover too wide a field the result is that the man gets up enough to pass an examination and be done with it, but when he comes to actual practice he has to revise for himself. If I had to teach a class of Public Health to medical students, I would think out just what it is that every general practitioner is necessarily thrown up against, and work backwards. As things stand just now, early atypical cases of infectious disease always come to them as a surprise. You *must*, therefore, have something perfectly exact, compact, and precise about all the primary infections ready to put into the student's mind, but instead of elaborating the whole of bacteriology, one should confine oneself in Public Health to the things that actually need to be done by the practitioner. He should be taught what he has to do in a case of scarlet fever or typhoid, and how to get into touch with the administrative machine that takes charge of such cases, and so on. Some men are taught far more about summer diarrhœa, typhoid, carrier cases, sewage, drainage, etc., than we have any right to ask a student to carry with him. The essentials of these things can be taught quite simply and practically partly by demonstration and, more important, partly by observation. In Aberdeen they have arranged as far as possible to work inductively. This develops great keenness of mind in the students and stimulates them to work backwards as it were, and their lecture passes into its proper place as a method of correlating their experience rather than as an attempt to convey experience.

In the matter of statistics, it is absolutely essential to know two or three fundamentals. But statistics are one of the great temptations of medical officers, and are mostly statistics about unrealities. I have got so tired of reading useless tables of figures that I have taken occasion to point out to some of my statistical friends that one gets as many facts from one case carefully managed as one does from hundreds of reports and tables. I learned this to my cost in the matter of the medical inspection of school children, where I gave currency to the weighing and measuring of them, and found that in a few years we were flooded with acres of tables, most of which were simply wastepaper. This sort of thing can be cut down, with tremendous saving of time, to two or three perfectly useful formulæ that ought to be in every general practitioner's mind. I agree with Professor Hay that the aim should be mastery within limits rather than the attempt to cover a wide area. Our ideas of preventive medicine are no longer what they were, and the science that began in clinical medicine and specialised out as methods of regulation, sanitation, and investigation of disease, has by a curious perversion of administrative development become so detached from clinical medicine that medical officers of health have often said to me that inspection of school children is *not* Public Health. They think nothing is Public Health except drainage and sanitation! I should like to see preventive medicine taking the broad scope suggested by Dr. Robertson. I gather that he wants the students coming to the Professor of Public Health, after they have been disciplined in other subjects, to take up with him the points necessary to put them in touch with the proper attitude to infection, to hospitals, to nursing, to tuberculosis, to food, to infant welfare, to clothing of infants, and so on. We found, for example, in connection with the travelling exhibition on child welfare, that medical men all over the country welcomed it in the most naïve way as filling a gap in their knowledge, for some of them had never before seen such things as infants' clothing, sucking-bottles, etc. Preventive medicine should, in my opinion, embrace not only sanitation, sewage, and drainage, but the environment and personal welfare of the individual from the antenatal stage right up to adult life.

Dr. Guy.—In the teaching of Public Health it is essential that the teacher should keep clearly in his mind the ultimate goal of his students. If he misses this, he misses a point of prime importance. His teaching may be interesting to a degree, but it will tend to be divorced from the practical things of life. Very few of the students ultimately enter the Public Health Services, and for their instruction a distinct extensive post-graduate course is prescribed.

The great majority of students end as general practitioners and many of them as practitioners on the insurance panel. That is, they spend their days in the laborious routine of a busy working practice. Now, in my judgment, Public Health should be so taught that these future practitioners, who form the great bulk of the students, should get some idea of the relationship of their individual efforts to the general Public Health. They should also get the idea fairly implanted in their mind that their highest aim ought to be the *prevention* of disease.

I took the trouble this week to read through the notes of two very complete courses of lectures on Public Health : one delivered last year in this city, and the other also delivered here fifteen years ago. A few salient points impressed me. The notes of the lectures delivered fifteen years ago when compared with those of last year seemed wonderfully up to date. They both agreed in the manifold diversity of material which the teachers had laid under contribution. Anything that in the remotest way touched Public Health has been discussed —things in heaven above, in the earth beneath, and in the waters under the earth—anything, in short, from stratified clouds to artesian wells. A considerable time was apparently spent in showing the student how to calculate the dew point from the wet and dry bulb thermometers. Cyclones, anticyclones, isotherms and anemometers are doubtless interesting things for aeroplane pilots, but have no practical bearing in the life of the general practitioner.

The process of the estimation of the amount of albuminoid ammonia in water is of importance to the specialist, but is it the sort of Public Health to be taught to future general practitioners?

There appears also from my study of these notes to be a complete lack of proportion in the relative importance of the various subjects. For instance, the same time was given to smallpox as was given to tuberculosis. I have no wish to minimise the importance of smallpox, but whereas its death-rate is nil, tuberculosis kills 1000 per week. Again, I met such a sentence as this— "Milk can convey such diseases as diphtheria, cholera, and also tuberculosis." Now, my criticism here is, that the relative importance of things has been altogether lost. Doubtless milk can convey the germ of cholera, but in these islands that fact is not for a moment to be classed with such an important subject as tuberculous milk.

Again, I missed many points which seemed to me to be of considerable importance. Syphilis and gonorrhœa have surely a Public Health aspect, and yet these diseases were never mentioned. Tuberculosis is a subject meriting a wide consideration, and yet far more attention was paid to meteorology. Housing was hardly even described as having any bearing on Public Health. Damp courses in walls were prominent, but the wide and great problems connected with housing were not spoken of.

Public Health admittedly has its problems in the factory life of to-day, and yet industrial hygiene was never introduced. Are there any Public Health problems in connection with excessive drinking? Surely ; yet intemperance as a cause of disease was not touched upon. My conclusion when I had read through these fairly full lectures was that the teaching of Public Health wanted remodelling altogether. What I should call the new aspect of Public Health has been missed entirely.

It appears to me that the better way to teach Public Health would be to begin with the child. Place the child in the midst and say, "Wanted a healthy child." This would introduce at once the care of the pregnant mother, with all its wide ramifications, as the feeding of necessitous expectant mothers, the antenatal clinic for diseased mothers, the pregnant mother in the factory. It would also introduce the question of maternity homes, the proper amount and method of dispensing the maternity grant, and the question of a maternity service.

With the birth of the child there could be mentioned the Births Notification Act, with its later provisions, and the various parts of the Children's Acts which deal with medical matters.

The risks the child runs in his first few months and in his first year of life could next be touched on, and then infant mortality could be introduced, not as a matter of abstract tables, but as something having a definite bearing on the life of the child. At this point child-welfare centres, preventive and remedial, could be explained. The problem of illegitimacy would next arise, and should be treated, not as a percentage rate of the total birth-rate, but as a live question demanding attention, and that immediately, in view of the higher death-rate amongst these unfortunate babies. Next, the various institutions which deal with child life could be brought under the student's notice, and their function and purpose explained—the crèche, the day nursery, the toddler's play-ground, the play centre proper, the kindergarten, etc.

Next, the child might be considered as a unit in a family, and this would be made the text for the introduction of the hygiene of the home. The environment, situation, ventilation, and lighting could be dealt with, and all dealt with, not as an end in themselves, but in order that the particular child might be enabled to grow up healthily. Next, the school life phase of the child's life should be considered in all its completeness and the special problems arising there discussed, having always in view that the practical outcome should make for a healthy school child. The whole field of school inspection could be here surveyed.

In like manner the adult should be dealt with, and the various points of importance in commercial life introduced—water supplies, refuse destruction, sewage disposal, and a few of the more important laws and bye-laws relative thereto could be touched upon. Factory life, with its associated problems of hours of labour, fatigue and its causes, and industrial diseases could be dealt with.

All the while the prominent ideas should be the prevention of disease, the maintenance of the adult in good health, and the important position that the student, as the future practitioner, will be called to occupy in relation to these ideals.

In the end our hypothetical individual might be buried, and this would give occasion to discuss the death-rate, earth burial, or cremation, with the laws relative thereto.

Treated in this fashion it seems to me that Public Health would appear in a new light altogether to the student, and would be of greater practical use to him in his life as a practitioner.

Dr. Currie.—The point of view from which the matter has been considered this evening is one which does not naturally appeal to me so much as the attitude of the Medical Officer of Health himself. I think for the ordinary Medical Officer of Health a secure foundation on the bacteriological, chemical, and epidemiological side is very important. Looking back on my own work, those three subjects of bacteriology, analytical chemistry, and epidemiology strike me as being conducive to one's ease of spirit. As regards bacteriology, the Medical Officer of Health will either do it himself or hand it on to someone else to do. If he does it himself, it is obvious that he must know as much of the subject as possible. But even if he is not going to do it himself, he has to control the expert—a very difficult task requiring considerable acquaintance with the subject, as well as tact and understanding. Many important problems may turn on what appears to be a small bacteriological point, and if the medical officer has to take the expert's opinion without being able to criticise it he is not in nearly so secure a position as if he had had a practical experience of the work himself. That is why I should wish the foundation of a practical knowledge of these three subjects to hold an important place in the medical curriculum. They should, moreover, be taught at an early stage, because they are things which a man can never acquire by intuition afterwards. Administrative acumen in regard to the general problems we have been discussing to-night will come to a man as his views on life expand, and what he may at first be deficient in he will make up as the years go by, but this is not the case in the three subjects I have cited, nor in a knowledge of the specific fevers. That, of course, is not the only side of Public Health work, but it is a very important side. Such important questions in the course of a medical officer's career may turn on his acquaintance with the symptoms of the specific fevers that I do not think too much time on the clinical side can be given to them, either during the man's course as a medical student or afterwards when he comes to take out the special course which prepares him for the Diploma of Public Health.

Turning now to the student in general as opposed to the student who intends to take up Public Health, I add a few words on the preventive aspects of the Insurance Act in its relation to medical teaching. Dr. Robertson has reminded us that the Act as a whole has a preventive outlook. It is so with medical benefit. It has been said that the Insurance practitioner spends his time in curing trivial ailments. On a broader view it might be held that he spends his time in forestalling serious ones. Such work is all in the way of prevention.

Sanatorium benefit, again, deals with the treatment of tuberculosis, and the Act itself provides funds for the erection of sanatoria. The medical student should understand clearly that the value of these facilities lies, not in treatment alone, but in the part which they should play, if rightly used, in checking the spread of the disease. He should realise the importance of early diagnosis, and should come to feel that it may depend on his own alertness whether his patient has a chance of recovery and his patient's family a chance of escaping infection. The instruction of the student along these lines would be preventive teaching.

Maternity benefit, which takes the form of a money payment, ought, if rightly used, to prevent in the mother the complications which may follow a premature return to work or household duty, and to promote the infant's well-being during its early days. The medical man, if present on the occasion, may have the opportunity of giving useful advice. These questions open the wider subject of child welfare, which should be represented in the medical course.

In the last place, I may refer to the preventive aspects of sickness benefit, which is a money payment during incapacity for work. These aspects, which are obvious enough, are apt to be complicated by the intrusion of the malingerer. The medical man can render a valuable public service here, both on the financial side and in the interests of national efficiency. Thus a week's rest for the worker at one time may prevent a long illness later : or a short extension of convalescence may make the difference between complete and partial recovery. The practitioner's duty in these matters is often difficult, and its exercise may sometimes expose him to blame. I think that the instruction of the medical student in some of the pitfalls of this work, and in its importance on the preventive side, might usefully find a place in the curriculum.

Dr. Norman Walker.—The first point in to-night's discussion that appealed to me was Dr. Robertson's suggestion that the medical student should not be taught along the lines of the Diploma in Public Health, that his course should be of preventive medicine, and that the Diploma in Public Health should be a great deal more practical than it is at present.

Professor Hay's remarks referred to the question of ulteriority and priority, a matter which comes in of course in all the subjects. Might not this competition be avoided by the expedient of conjoining the courses much more than is at present done? The present system of a series of short courses is not a good one for the student. He is supposed to cram in in eight or nine weeks all the instruction in a particular subject. In this subject it is a common experience to find the men well up at the examination, but twelve months later before qualifying they have forgotten everything they had learned. If Dr. Robertson's idea of a preventive medicine course be carried out, why should it not run far longer than ten weeks? Medicine begins in the third winter here. Why should not the teacher of preventive medicine come into the class as it goes on and teach the preventive aspect of things as they come up? I would much sooner have the students once a week for eighteen months than every day for ten weeks.

The question of the Diploma in Public Health is, I think, out of our consideration to-night. I feel a considerable amount of sympathy with Dr. Guy when he says that meteorology is not a thing which very much concerns the average student. Twelve months after the class not one in a hundred would know anything about it.

I would rather take issue with Dr. Leslie Mackenzie in his wholesale condemnation of lectures. I have attended three series of discussions of this kind here—one of them a great many years ago, at which Sir John Struthers expressed himself as very much opposed to lectures and the late Professor Rutherford as in favour of them. While I have great faith in practical teaching, I should be very sorry to give up a considerable number of lectures. There is a theory that the student reads. But he does not read the right thing so far as my experience goes, and I think the curriculum would lose if we were to get rid of all lectures.

The point I am most anxious to make and should like to have seriously considered by the authorities in connection with teaching is the spreading of the special classes over longer periods than they occupy at present.

Dr. Rainy.—Dr. Leslie Mackenzie put it that practical work was essential. It seems to me, however, that in some aspects to do the practical work in Public Health would be much more difficult than in most classes. How would he propose to carry out slaughter-house visiting, sewage inspection, and so on, with classes as large as we have them now? Would he multiply the assistants?

Dr. Leslie Mackenzie.—I did not mean that we should get rid entirely of lectures in order to spend the time on the merely practical, but what I missed myself, and what I know the men miss, is a want of familiarity with the realities, when they have learned merely by words. There is so much concrete material that can be put before them to force them to exercise their faculties of observation. The splendid practical classes in physiology, anatomy, etc., have led to such a transformation in practical laboratory work that now, instead of being scoffed at, it is used as the basis of the theoretical instruction. The same thing applies to clinical medicine. You put stress on your cases in a way that is absolutely a part of medical teaching, to my mind. I would aim at the same sort of thing in Public Health. There is nothing so easy; the material is endless. I strongly share Dr. Guy's feeling that Professor Hunter Stewart's course teaches far too much, except for examination purposes. In view of the developments in the Army, one cannot forget that during the next four or five years the importance of the question of physical education and remedial massage and gymnastics—in fact the whole matter of physical methods as applied to health—will be vastly enhanced.

Professor Lorrain Smith.—I have a very strong feeling that a cardinal point in medicine should be a knowledge of nursing and the method of training nurses to carry out treatment. Where you have an intelligent mother or person in charge it is all right, but otherwise disasters happen. I do think that a great deal could be done in administrative medicine if the nurse were kept to the front as the person responsible for carrying out the medical instructions. The general practitioner is brought face to face with an enormous number of practical little things which he has never thought of and never seen.

Dr. C. B. Ker.—As far as we have gone to-night we have more or less come to the conclusion that too much is attempted to be taught, and that it is taught too much for examination purposes. Dr. Robertson's point that the student should not be expected to learn what is really proper to the Diploma in Public Health is quite sound.

Professor Hay made a suggestion which I think would be unfortunate were it carried out, viz. that the infectious diseases should be separated from medicine. The student has already far too many classes to go to, and I do not think that there would be any particular advantage in cutting out this group of diseases from the syllabus of the professor of medicine. On the other hand, there are certain difficulties in making students familiar with infectious diseases, but we shall just have to continue to put up with these difficulties. It all depends on when a man comes to the fever hospital whether he sees particular diseases or not. What he wants to do is to learn to read intelligently.

It is a little dangerous that the Medical Officer of Health should be encouraged to regard himself as a bacteriologist. How can he do his own work and keep up with the developments of modern bacteriology?

In the old days when we were taught in a course of fifty lectures medical jurisprudence and public health together we knew just about as much as the medical student to-day, and we saved about fifty lectures. The idea of running the course of Public Health over a longer period is a good one. If it were run over the last three years of the course the men would take more interest in it: say one lecture a week or a fortnight. With a little co-ordination much advantage would accrue from this arrangement.

PROFESSOR LORRAIN SMITH.—We should probe a little further Dr. Robertson's position when he says there are very few diseases in regard to which preventive measures cannot be effectively taken. I understand the suggestion is that there should be a system of teaching the preventive side over practically the whole range of systematic teaching in medicine.

DR. ROBERTSON.—Of course that idea cannot be worked out very practically for many diseases at the present time. We are preparing the medical men for *national* work, and therefore it is important to the nation that they should have the idea of prevention instilled from the start of their teaching in medicine to the finish of their course. I cannot express too strongly my admiration for the general practitioner: he is the basis of all medicine. My great regret is that as a Medical Officer of Health one is out of contact with the sick individual. Diseases like bronchitis and pneumonia could be greatly affected by preventive medicine; if chairs of preventive medicine were established, duodenal ulcer, gastric ulcer, colitis, and many other diseases which cause serious illness could be tackled with advantage. It would pay the Government enormously to see to this, and I hope that soon they will attend to many of these questions of clinical research, and that the National Insurance Research Committee will presently deal with much wider subjects than they do now. The general practitioner needs to know everything that can be known at present in regard to preventive medicine.

PROFESSOR LORRAIN SMITH.—I gather that, so far as munition work is concerned, a start has been made in this direction by Sir George Newman, who is tabulating the particular ailments which come from overwork or from work causing special strain or special exhaustion. I suppose that is the sort of work on which you would base your idea, Dr. Robertson? But how would you carry it out? What type of person would be expected to undertake this teaching?

DR. ROBERTSON.—In the case of Public Health there is not much in a name: it is a name applied to a whole series of subjects grouped together that are more or less useful. I have said that I would abolish the subjects at present taught so far as the teaching of the medical student is concerned. But they could be very much more developed than they are at present for the benefit of the Diploma in Public Health student, who could follow them quite well if he had got a good primary scientific training, *i.e.* if he had been well taught in physics, chemistry, and biology. When you come to the teacher whose special duty this "Public Health" teaching is—I do not think he exists at the present time. Take, for example, the Professor of Public Health in *any* university just now. He runs over fevers in the way the text-books do; but I think he should consider their prevention very much more practically than is done at the present time. I would take nearly all the other diseases dealt with by the professor of medicine, and without doing too much on their treatment one might discuss their etiology a little more. The point is, if you give these things as a special course the student will be impressed with the absolute necessity for advising everywhere and everybody on the means of prevention. Every day I see all sorts of opportunities missed by medical men with the best of intentions. If they were imbued with this idea of prevention, when they came across a bad house or conditions they would take steps—or make their patient do so—to set in operation the authority needed to remedy the matter. In this way an enormous amount of disease could be avoided. The question of proper physical culture is emphasised by the conditions in the Army. This also might quite well be taught as a part of preventive medicine. In America it is considered such an important subject that several universities have appointed professors of physical culture, who are doing magnificent work in many directions.

PROFESSOR LORRAIN SMITH.—The best illustration I know of preventive medicine is child welfare work. It is essentially an instance of preventive medicine applied to the individual. I gather that you would extend this conception generally?

DR. ROBERTSON.—Yes, to the baby, the toddler, the school child, and the young adult; and I think very urgently also to the middle-aged man. Many middle-aged men could have their lives extended by five or ten years if they were told in time that certain things were obviously damaging them.

DR. CHALMERS WATSON.—As a clinician, I consider that the ideal course of preventive medicine for medical students would be framed on the lines laid down by Dr. Leslie Mackenzie and Dr. Guy. Such a course would involve a revolution in the present system of instruction. It would be of great advantage to the clinician to know that the subject of preventive medicine was being presented to the student on such broad, practical, and modern lines. One could not but be impressed by the breadth of outlook revealed in Dr. Robertson's paper. He approached the subject largely from the standpoint of the physician, and I agree with him as to the value of preventive medicine, both in young adult life and middle age. The subject of diet is of fundamental importance, but little or no serious attention is paid to it in the curriculum. I should like also to associate myself with Dr. Mackenzie's reference to the value of the nursing profession, and to the possibility of attaining greater assistance from them.

DR. TRAQUAIR.—I feel very strongly on what Dr. Walker said about spreading special classes over a longer time. In connection with diseases of the eye, I suppose there are about 30,000 blind people in the United Kingdom, half of whom owe their blindness to preventable causes. Including accidents and taking thought of the number of hours lost by workmen owing to small injuries of the eye, one realises that the loss of time and wages due to preventable affections of the eyes is enormous. If the general practitioner regarded prevention seriously, the public would in time do so also. At present, for example, it is an exceedingly difficult thing to persuade workmen to protect themselves against eye injuries.

Dr. Gibbs.—My own little speciality illustrates Dr. Robertson's views well. Dental caries and pyorrhœa alveolaris are the two commonest diseases of western civilised life, and the most easily prevented. I have been reading Dr. Leslie Mackenzie's last Report on Scotland, in which he points out that we do not probably know all the factors that lead to these conditions. That is quite true, but we do know by long clinical experience that by the very slightest attention to diet these diseases can be absolutely prevented. The child can grow up with no dental caries; the adult can keep his teeth to old age. I have been preaching this for the last fifteen years, but the ignorance of the general practitioner undoes practically everything that many of us keenly interested in preventive medicine in this direction are trying to do. I, for one, am constantly up against the medical man insisting on my patients having sweets because "sugar is good for them." What did they do a hundred years ago, when sugar was not known in Scotland? When I have done my level best to put my patients' teeth right, they deliberately undo all my attempts to save them. It is a clinical fact that we can, if we wish, prevent dental disease, and it could be taught to the student in one lecture. My point is, you can teach the student but you cannot teach the general practitioner.

Dr. Sillar.—When would the course of preventive medicine come in most valuably in the curriculum? Should it implement previous subjects or should it be taken very early in the curriculum in order to allow the basis of the problems which the student is, as it were, to have focussed in order that he should understand a great deal of the special instruction which he receives later. As an illustration, take the feeding of infants. I should like to know whether Dr. Robertson would suggest that this subject of infant feeding be taught by the professor of medicine or by the physiologist or the professor of clinical medicine.

Dr. Robertson.—I have no very hard-and-fast opinion on this subject at present, not yet having made out a syllabus for this course. But my first feeling is that one cannot possibly teach prevention until one knows the diseases one wants to prevent, so that I should have thought that prevention must follow very closely the ordinary course of medicine. Surely also that must be the case with regard to the prevention of diseases of infancy and childhood. The course on diseases of children might very well precede or run concurrently with the lectures on prevention of disease: the two ought to be very closely correlated. I do not see how you could take it as a course anterior, and therefore the position in the curriculum of preventive medicine would come very obviously in the third year. I agree that it would be a good idea to make these lectures spread over as long a time as possible, to make them as practical as possible, and to let the medical student see what can be done, among other things, in the proper rearing of infants and children. There is excellent material available for that. One sympathises with the difficulty of those who have to deal with very large classes. It is hopeless to demonstrate to more than thirty students at a time.

Dr. John Thomson.—With regard to the teaching of infant feeding, I might remind Dr. Sillar that it is only since the war began that the teaching of the diseases of children has been compulsory here, and I think he will find the general practitioners who have recently graduated are fairly well up in it. In the present course of diseases of children perhaps one-fifth of the lectures are given to the subject of feeding, and I hope that that may be increased in future.

Dr. J. S. Fowler.—I agree with Dr. Robertson that it would be an advantage to have preventive medicine studied more in the university. But the problem really is not wholly to bring it before the student in a more systematic way but also to extend to the poorer class the preventive medicine available to the well-to-do. A great step has been made in regard to children by the introduction of welfare centres. These centres are taking the same kind of preventive interest in the children of the poor that prevails in the better-class houses.

I agree that it is unnecessary to teach the student much of the Public Health he learns just now and that he should be rather taught to get into touch with the proper agencies as occasion demands.

Dr. Fleming.—In the therapeutics and clinical medicine of to-day I think a good deal of preventive teaching comes in, and I am not quite sure where the preventive teacher from the Public Health point of view is going to step in and take away from the medical and clinical teachers what they are attempting to do. I do not think, of course, that we give enough preventive teaching, and I think it is most useful to have the point impressed upon us. But I certainly think that in teaching fevers in the medicine course we try to take up the preventive side.

XXIII.—THE TEACHING OF MEDICINE.

By Professor WILLIAM RUSSELL.

I shall begin by presenting to the Club a copy of a paper published by me in 1910, entitled *A Working Plan of Clinical Medicine Teaching.* Since that time an alteration has been made in the curriculum; the positions of medicine and surgery having been transposed. There are great advantages in this transposition; those to medicine are considerable, and, I think, those to surgery are still greater. One of the advantages is that the transposition brings the teaching of medicine into conjunction with the teaching of pathology and materia medica. This conjunction, I take it, is a sound arrangement. Physical examination and diagnosis hang largely upon our knowledge of pathology; and the treatment of diseases hangs, of course, upon pharmacology and therapeutics. The result, however, of this direct conjunction between the subjects I have mentioned depends upon how the scheme is carried out; it depends upon the loyal and intimate co-operation and co-ordination of teachers, having for its definite object the efficient teaching of the student rather than being determined by the whim or convenience of the teachers.

In the first place, it is essential that the teacher should fully realise the stage his pupils are at. He has a great opportunity for determining the bent of their minds towards practical medicine, instead of being directed at the outset towards the standpoint of surgery. I ask you to think for a moment of the position of the student beginning the study of medicine in his third winter. He has completed his physiological and his anatomical studies. He has had absolutely no previous contact with either normal or abnormal clinical phenomena. He is entirely ignorant of these, except in so far as he has a certain theoretical knowledge of them from the study of anatomy and physiology. He comes to us in that perfectly virgin condition of mind; and the method which seems to me to be the only satisfactory one in his first term, which only includes ten weeks, is that it should be devoted entirely to the physical examination of the circulation, the lungs, the abdomen, and the nervous system. I ask you to think what this means to the student, as I have tried to picture him to you. It means that he has to learn to hear heart-sounds—to learn to determine clearly the first from the second sound; he has to learn to hear the sounds produced over the respiratory organs during respiration; and he has further to learn to examine the organs in the abdomen in so far as they are open to investigation. He has also to learn to examine the nervous system—the proper method of determining whether a patient has lost the power of voluntary movement anywhere, the amount of loss of power, and so on. He has therefore a very large field to cover, which can only be successfully covered by the individual student learning to do all those things. My experience is that it takes weeks before the student can be quite sure as to whether heart-sounds are feeble or not feeble, before he is quite sure that he knows the first sound from the second, and so on. But unless he learns this he cannot succeed in the later stages of his work. No doubt, while he is learning these things, one at the same time begins rapidly to introduce abnormal conditions to his notice—*e.g.* dulness on one side of the chest as compared with the other, abnormal sounds in the heart. All this is difficult enough for the student, but the teacher also has his difficulties, and one of them is, how definitely to satisfy himself that all the members of his class are really learning the things that they *must* know—the things that are the mere alphabet of the teaching, and yet without a knowledge of which teaching will fail.

It is not enough to talk to the students about these things—they have got to learn to *do* them over and over again. They never acquire confidence in their own observations until they have examined many lungs and hearts, and so on. It is necessary and desirable that this practical teaching should be accompanied by a certain amount of exposition of the meaning of normal phenomena. From the standpoint of the student's physiological and anatomical knowledge, the teacher must expound to him the significance and meaning of the respiratory sounds in different parts of the respiratory tract, and the same with regard to the heart sounds. When the abnormal is approached, the same methods of exposition are necessary. Without any knowledge of morbid anatomy the student can be taught to know and to understand the circulatory phenomena, the respiratory phenomena, certain matters in the abdomen, and the method of examination of the nervous system. With little knowledge of pathology he can be taught to understand heart and lung abnormal phenomena, abdominal conditions, the reflexes, and other phenomena in nervous cases. This, in my experience, takes the greater part of the ten weeks of this first term. No doubt this work is laborious and tiresome for a senior teacher, but I have always felt at the end of it that it was as worth while to him as to his pupils, because, this point reached, the student makes rapid progress. During this winter I had the opportunity of intensifying the application of this method with my third-winter students, and I was amazed at the extraordinary and rapid progress made in the physical examination of patients by the time the Christmas vacation came. My feeling about this elementary work is that it specially requires an expert and experienced teacher. The longer I live, the more I am satisfied that the young and inexperienced teacher is not so good at it as the more experienced one.

The second term is devoted to case-taking and the consideration of individual disorders and diseases, associated, of course, with the history and the subjective phenomena and the importance and significance of these in reaching a diagnosis. With this groundwork you can carry the student anywhere; without it you will get men coming up for their final examination who do not know how to examine the heart, who cannot distinguish between puerile breathing and bronchial breathing, who cannot tell you whether a liver is enlarged, and who cannot apply the ordinary methods for the examination of the nervous system.

I need not occupy your time further in regard to the teaching of clinical medicine to the junior student. There is no difficulty in teaching the senior student if he knows how to examine patients correctly.

A few words as to co-ordination. The first question one asks here is, "What ought pathology to do?" I venture to suggest that pathology, to help us, must begin with inflammation. I might even suggest that the inflammation of free surfaces be rapidly overtaken; after that, heart, lungs, vessels, abdominal organs, and nervous system ought as rapidly as possible to be gone over. Secondly, "What ought systematic medicine to do?" I venture to say that systematic medicine ought to begin at once with the heart and circulation, and from there to go on to the lungs, abdominal organs, and nervous system. I think fevers should be taught elsewhere, and be only very briefly dealt with in the systematic course. As to systematic teaching of medicine, in all the systems it is wise to begin by recalling the anatomy and physiology of the organs, so as to correlate the student's knowledge of anatomy to the facts of medicine. By so doing, pathology is given the start of a few days, so that it can be in advance of the medicine teaching. Practical medicine is, in fact, the science of disordered function and of altered anatomy. Pathology and systematic medicine, as well as clinical medicine, can be approached from the physiological and anatomical standpoints.

With regard to the systematic lecture, I take it that it has definite advantages. The tendency of systematic lecturing, I think, is to give too much; it is not necessary for a systematic course of lectures to be an elaborate text-book, nor is it necessarily a very prolonged course. But it ought to be better than any text-book. It implies, of course, a very true sense of perspective on the part of the lecturer, that he is capable of big generalisations, and that he has the power of exposition. It is difficult for me to get altogether away from the belief that the teaching of the lecture-room is not compensated for by the mere reading of text-books. There is no time to read the number of books that it would be necessary to read, and the systematic lecture in medicine ought to include the complete knowledge and experience of the lecturer who has acquired that sense of perspective in medicine which is so desirable and so necessary, and which can be presented in the lecture-room but is difficult to present in a text-book of moderate dimensions.

XXIV.—THE TEACHING OF MEDICINE.

By PROFESSOR G. LOVELL GULLAND.

IN these remarks I do not propose to discuss the ideal course of medicine, but only to expose to you some of the present difficulties with which we have to deal, in the hope that you may be able to help us. I was appointed during the war to a chair which has long been starved in the matter of equipment, and war-time conditions do not allow me to do more than dream of what I want to do and make the smallest beginnings towards it.

The order in which I give my lectures is very much that which Professor Russell describes; but I always take fevers first in order to let the pathologist get ahead of me, so that when we do come to discuss the heart and the lungs, and so on, the men have had a little of it before.

I entirely agree, also, with Professor Russell as to the necessity of at any rate a certain amount of systematic teaching. You cannot get the student to read text-books systematically and steadily without the regular stimulus of systematic discussion. Professor Russell laid stress upon one point which I think is of great importance, viz. that the systematic lecturer can select the significant and point out to the student what it is really important for him to know in a way that the text-book does not and never can do. Further, a text-book the minute it is published almost is out of date. One's lectures have to be constantly revised. Since I began lecturing in medicine about twelve years ago I have rewritten a large part of my heart lectures four times, and many of the other subjects, in which advance was being made, almost as often. I do not know whether it is good for the student to listen to systematic lectures, but it is certainly good for the lecturer to give them. For it means that once a year at least he has to review his knowledge of every department of medicine. I began lecturing systematically with the idea that my students were not to take notes but to listen to me, but I soon found that they would not allow that. What they wanted was a set of good notes which they could read instead of a text-book. One has to remember also that unless a student is taking notes his attention inevitably wanders at times. We all know that written notes are the best aid to memory. I regret that students have got out of the way of taking notes in clinical lectures, because one is apt in clinical lectures to make useful generalisations in a way one cannot always do in systematic teaching. One has further to remember as a systematic teacher three things that the student wants. In the first place, he wants to get through his Final. That looms largest. Secondly, he wants in medicine to get what will help him to understand his clinical work and his dispensary work. Thirdly, he wants to get what will help him in practice. The lecturer's view is an exactly opposite one, but for success in teaching one must compromise to a certain extent. There are many other things to remember, *e.g.* that medicine is not a science but an art; it is based more and more upon science every day, but it is not and never will be a purely scientific subject. One has to impress upon the student that he is dealing with men and women—not with diseases, but with people who have diseases.

We are faced with the question next as to whether the present number of lectures—one hundred—is the proper one. Of course medicine is the largest subject in the curriculum, and if one is to teach it in anything like detail the hundred lectures are far too few. On the other hand, if one is going to teach only broad generalisations or selected subjects, a hundred lectures are too many. My own ideal perhaps would be a course of one hundred and fifty meetings, of which fifty or more would be practical. And this practical part should not be taken separately but should accompany the individual systems, *i.e.* when taking, say, the heart first of all, the student would be obliged to exercise himself upon the various cardiac instruments, and he would be very carefully shown those which he cannot himself use, and so on. When the lungs are treated of, he should be made to examine sputa, pleural fluids, etc., far more fully than is at present done or can possibly be done in the tutorial classes. For many years Sir Robert Philip and I gave such a class on the practical side, which was a very useful one in its day. But fully to develop this idea would mean a subdivision of the large classes with which we deal for the practical part; it would mean a department which I have not got, and assistants whom I have not got either.

I regard the place of the course of medicine in the present curriculum as extremely unsatisfactory—for three main reasons. In the first place, because the student is insufficiently prepared. Pathology and materia medica should precede medicine. A great deal is made of the necessity of some knowledge of medicine in order to appreciate pathology and materia medica. I cannot remember that I had as a student any great difficulty in appreciating either of these subjects, although I did not know very much about medicine. One has to remember that pathology and materia medica are going to be passed and done with to a great extent, while medicine is to be the lifework of the larger number of students, and it seems, therefore, absurd that medicine should be used to make pathology and materia medica clear to students: it should be the other way round. Secondly, the winter in which medicine is now taught—the third winter—is too full already, and it is overshadowed in the case of a great many students by the Third Professional. Even when the examination is not at the immediate end of the winter session, its subjects are the immediate interest. The Final is a long way off, and students perfectly naturally tend to work rather at pathology and materia medica than at medicine. I think there is too much teaching of pathology. Not that I would willingly curtail it —I spent too many years in the study of pathology not to know its value; but considering that the student has to do clinical medicine, medicine, and materia medica at the same time, there is too much pathology. The students complain to me constantly that they do not get time to do their medicine, and especially their clinical work, thoroughly because of this. The third point is that the course is too far away from the Final. From the end of the third winter until perhaps the second term of the fifth winter the student does no medicine except what happens to come into the special courses and dispensary work. We are going to remedy that to a certain extent by insisting that the senior student in clinical medicine does not, as he has often done, regard his last three months as a sort of dilettante attendance on clinical lectures and wandering about the wards, but that he really does subject himself to exactly the same discipline as the junior, except that he does not have to attend tutorial classes. But I doubt very much whether that will be really sufficient. There are two possible remedies that I see for this difficulty. I am quite convinced that, as regards the systematic lectures, the early part of the session, so far as real understanding of what is being done goes, is largely wasted, and it is impossible not to feel that pathology ought to precede medicine. My first remedy would be the transposition of surgery and medicine to their former places. Surgery has always seemed to me a very much more natural introduction to clinical study than medicine, because you teach the student from the first to use his hands: you let him make use of his anatomy at once in a way that he does not do if he passes to medicine, because, after all, the amount of minute anatomy required in medicine is comparatively small, especially for junior students. He would remember his anatomy in a way which he certainly does not at present. The amount of pathology which is required for surgery is, I think, not so great as that required for the study of medicine, and what is not given by the pathologist can very easily be given—as a matter of fact is given—by the surgeons themselves. Another way out of the difficulty, if the teachers of pathology and materia medica insist upon the students knowing something of medicine, is that the course of systematic medicine could be broken into two three-months' courses— the first being given to junior students in the first three months of the third winter, and dealing with the main, simple, ordinary diseases, followed by a more advanced course for the seniors in the second term of the fifth winter while they are taking out their second term of clinical medicine. I should like very much to hear the views of the Club as to these points.

Though it is not perhaps strictly within the purview of this discussion, I think one might say a word about examinations. I certainly regard them as very unsatisfactory. It is essential that we get more time to make the final examinations much more practical and much more searching. In clinical medicine the "spotting" of urines and microscopes is a mere farce; we ought to insist upon real urine testing, real chemical examination of other substances, and real microscopic work. Whether that should be done at the systematic oral or at the clinical oral I think does not very much matter. We should also consider the advisability of including in the final examination the results of class examinations and the work in the wards, so as to encourage steady work and discourage spurting. We all know that neither the student nor the examiner is always at his best at an oral examination. I think that confidential reports from the systematic and clinical teachers might well take their place in determining whether a man should pass his Final, and at what level.

As regards the teaching of clinical medicine in particular, I do not know whether it is known to you that at the beginning of this winter a statement was drawn up by the medical faculty, after considerable consultation, on the improvement of clinical medicine after the war. It is a long document which I need not read to you; its main features are—limitation of size of cliniques; differentiation of junior and senior teaching and consequent subdivision of classes; much fuller utilisation of the services of the assistant physicians for this; closer supervision of case-taking; compulsory attendance at the medical out-patient department, with roll-call there and in the wards; the tutorial to last six months; the following up of cases that die to the post-mortem room; the pathological investigation of the material by the clerk of the case, etc.

I think a great deal may be done by further correlation between the systematic and clinical teaching. In my own wards I try to teach as far as I can upon the subject on which I happen to be lecturing systematically at that time. I think it might be very well worth while for the systematic lecturers in medicine to run their courses on parallel lines, and to ask their clinical brethren to unite with them in going over the same subjects which are being dealt with systematically.

Of course the weak point, as regards practice, in our teaching is that it is conducted on hospital patients—*i.e.* either on people so seriously ill that they cannot be handled by large numbers of students, or else on cases of well-established disease, which are excellent for the examination of physical signs, but which do not admit of really curative or preventive treatment. That is one reason, I think, why the practitioner is often weak in diagnosing the early stages of chronic disease, and in the treatment of these early stages. The student does not see enough of the slighter and early cases which will form the bulk of his work in general practice. That gap is filled to a certain extent by the out-patient department, but, unfortunately, a large number of the cases which come up there are of the same "hospital" type. Our only help with this difficulty is the Dispensary system, which is, of course, one of the very strong points of Edinburgh. I foresee that if we are to make the best use of the Dispensaries we shall have to assume more control over them. We shall have to carry them with us, of course, and to a certain extent—I speak here with great diffidence—some central body must control their selection of medical officers, so that they shall be men who are fond of teaching, who can teach, and who are willing to take the necessary time to supervise their students in both outdoor and indoor work. Further, we shall have to see that the Dispensary cliniques are limited to the number of students who can usefully be taught and that each student looks after a proper number of cases outside. This will certainly mean the diversion of students from the more accessible and hence more popular Dispensaries to the less accessible.

Of course one has to realise that it is not desirable to attempt too much. The student must go on learning all his days, and our business is not so much, as Professor Russell has pointed out, to teach him as to help him to teach himself. We do manage in Edinburgh somehow to turn out men who keep on learning. I have kept in pretty close touch with what has been going on on various fronts, and many men there, who were not specially brilliant here, I hear of as deserving trust and doing exceedingly well; and I hear from many men there that they prefer Edinburgh men and stick to them when they have got them. In Malta we had about three hundred medical officers, of whom sixty were Edinburgh men—and they were the sixty best, all things considered. Fully one-third of the hospitals were commanded by Edinburgh men, and these were the best administered hospitals. I do not think that we have any reason to disparage ourselves. I do not say, however, that we cannot do better, and if you can point out to me how I personally can do better I shall be only too delighted.

XXV.—THE TEACHING OF MEDICINE.

By Dr. EDWIN MATTHEW, Assistant Physician, Royal Infirmary.

(*A*) The Teaching Arrangements in Medicine.

During the past eighteen months the assistant physicians to the Royal Infirmary have had under consideration the present teaching arrangements in medicine and the present state of hospital equipment in relation to this teaching. Certain defects were noted and discussed, and it was recognised that various improvements might with advantage be made. The invitation of the Pathological Club to contribute a paper on the teaching of medicine has afforded them the opportunity of presenting the conclusions unanimously arrived at, and by arrangement these conclusions and the recommendations arising out of them are presented in this paper.*

The efficiency and status of the Edinburgh Medical School largely depend on the standard set by the teachers of clinical medicine and surgery. The function of the school is to turn out thoroughly qualified practical men, well versed in modern methods of investigating and treating disease in its early and late stages—men imbued with a desire to help in advancing our knowledge of disease, recognising that in many directions their aid is both necessary and valuable.

The existing system is, in many directions, defective, and its defects are largely responsible for the dissatisfaction—openly expressed by some and felt by most—with the position and aims of the medical school at the present time. The assistant physicians frankly admit their share of responsibility in this matter, and are only anxious to have it corrected with as little delay as possible. The defects in the present system include: (*a*) Defects in the teaching arrangements proper, and (*b*) defects in equipment, which limit the efficiency of the teaching. The subject may be discussed conveniently under these two heads.

Teaching Arrangements—1. *Systematic Medicine.*—The systematic lecture has always been the basis of teaching in all subjects of the medical curriculum. The system has much in its favour, but as in other subjects, so in medicine, the systematic lecture can be overdone. If the aim is to give the student, in a course of one hundred lectures, a more or less complete account of diseased conditions—their recognition, results, and treatment—the method must necessarily resolve itself into a mere dictation exercise, with little benefit to the student. (For this purpose one or other of the many excellent text-books can be utilised.) The duties of the professor might with advantage be considerably lightened, in so far as the number of systematic lectures is concerned; the course of instruction would greatly benefit thereby. Tuberculosis now has a chair to itself; fevers are fully dealt with elsewhere; there is a compulsory course on diseases of the skin. Much more attention should be paid to therapeutics, including general therapeutics, physical therapeutics, and dietetics; these should, so far as definite instruction is concerned, be taken in a separate course. The lectures in medicine could thus be reduced say to fifty, not necessarily delivered consecutively, and the remaining time be devoted to more practical work; there are many subjects in medicine which can be taught practically by the Professor of Systematic Medicine. For this purpose the professor should have more assistance; a scheme might be devised whereby the clinical tutors would be available for this work. In addition, the professor of medicine should take cognisance of two special branches of medicine which we believe are entirely neglected, viz. psychology in relation to medicine and medical ethics.

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* Dr. Ritchie, absent on military duty, took no part in these deliberations; Dr. Goodall, up to the date of his departure on war service a few months ago, was in complete general agreement with his colleagues.

2. *Clinical Medicine.* — Instruction in clinical medicine includes clinical lectures, bedside cliniques, instruction in the medical out-patient department, clinical tutorial instruction, and dispensary practice. These will be considered *seriatim.*

(a) *Clinical Lectures.*—The arrangement recently adopted of having separate lectures for juniors and seniors is the only feasible one, and should be strictly adhered to, a senior student being defined as one who has attended bedside cliniques for six months. Lectures are delivered twice a week by the lecturers in rotation. At present each lecturer is in a compartment by himself, and, more or less, lectures independently of his colleagues. In our opinion the subjects for lecture should be carefully considered by the Clinical Board, and at the beginning of the session a syllabus should be drawn up of lectures suitable for junior and senior students. It is possible to draw up a scheme of lectures which would be a great advance on the present system, a scheme which would still give the physician in charge a really free hand in the choice of subjects.

(b) *Bedside Cliniques.*—The best results from teaching at the bedside can, in our view, only be obtained under the following conditions:—

1. The separation of junior and senior students. In the university calendar, under clinical medicine, it is stated that clinical lectures are delivered to senior and junior students separately; it would be well if the word "separately" were also included under bedside instruction.

2. By limitation of the cliniques. This was laid down as a regulation by the teaching staff about six years ago, but never effectively

carried out. Only in this way can the student see and hear what he is meant to see and hear; also, in a limited clinique, the teacher can quickly appreciate and discriminate the different grades of intelligence among the students. Any number greater than twenty-five is too large. Of course, if the total number of either junior or senior students exceeds 150, then each clinique will have to be proportionately larger.

3. That attendance by the students be regularly ascertained and enforced. If the clinical teacher has his responsibilities so has the student; he should be encouraged to be in the wards as much as possible, and also urged to observe and learn for himself, and not depend alone for his clinical knowledge on what he hears at clinique; he should be made to verify facts for himself by repeated examination, and time should be available for this.

4. The case records of the students should be taken into consideration in regard to qualifying certificates. The junior house physician should be responsible for assisting the students in case-taking, and the cases should be read and examined by the physician in charge. A student's work during his qualifying nine months—his records of cases, his attendance at cliniques and in the wards—should be available for reference and taken into consideration at the final examination.

5. Cliniques, for the junior student especially, should be more systematised. Haphazard choosing of cases for clinique, because they are good cases, does not give the student the proper grasp which orderly instruction in the various conditions of the different systems would. It is possible that at any one time suitable material is not available in any one charge for orderly instruction of systems, but it should be possible to make arrangements whereby the material in all the wards is open to every teacher for clinique purposes.

(c) *Medical Out-Patient Department.*—In recent years the arrangements in the medical out-patient department have, from the teaching standpoint, been far from satisfactory. Students drop in at all times—students who have done no clinical medicine, students who have done three months, six months, or nine months, and graduates. Effective teaching cannot be carried on under such conditions. The clinique should be restricted to senior students, those attached to a particular charge receiving out-patient instruction on the day the physician is waiting. An attempt has been made, beginning in January of this year, to organise such a clinique, but unfortunately, and wrongly we think, junior students have been instructed to attend. In our view, attendance at out-patient cliniques is not for the student who is still unfamiliar with the ordinary physical signs of disease.

(d) *Clinical Tutorials.*—A large part of the work of the tutor should be the personal supervision of the side-room work done by the student on his cases. The work should be of a very individual nature, as little class instruction as possible being included. If the curriculum would allow, it would be a great advantage for the student to have a short course of instruction in physical methods prior to commencing ward work proper. This course would be devoted exclusively to methods of examination and physical signs present in health. The clinical tutor might with advantage have the assistance of senior student demonstrators in this course.

(e) *Dispensary Teaching.*—Dispensary practice is of great value to the student. A great part of his afterwork consists in the recognition and treatment of minor maladies, which he does not and cannot see in the wards of the Infirmary, but which are of everyday occurrence in Dispensary practice. Dispensary teaching should be definitely co-ordinated with the teaching in the Infirmary, and, in addition, the teaching in the Dispensary should be devised to meet this. If this arrangement were carried out, the teaching of medicine from the curative point of view could be brought into line with teaching from the preventive point of view. We concur in the advisability of this course as outlined by Dr. Robertson in the discussion on Preventive Medicine.

Final Examination in Medicine.—After a compulsory nine months' instruction in clinical medicine the student proceeds to his final examination. This examination, we believe, is not adequate, being too short and too casual, and it is doubtful if the fairest and best results are at present obtained. Longer time should be given to the oral examination of each student, and the examination in special or side-room work should be extended. This implies that the final examination should either extend over a longer time, or that more examiners be employed. In our opinion both are necessary, and we believe this can be easily met by appointing as examiners all the teachers in the Infirmary, both physicians and assistant physicians. We believe that the raising of the standard of the final examination on the above lines would be of great value in assuring the student's attendance at, and work in, the medical wards and side-rooms.

Before leaving this part of the subject, I may add that we are aware that in the last year or two the whole subject of the more efficient teaching of medicine has been under the consideration of the medical faculty, and a report was drawn up by them embodying certain recommendations which it was suggested should come into force after the war. This report was, we understand, in general approved of by the Board of Studies last year. We have recently had an opportunity of seeing this memorandum, and find that many of the recommendations in it are identical with those independently arrived at by us, and presented above.

I pass now to another aspect of teaching of very special importance to the medical school, namely, that of Hospital Equipment in Relation to Teaching.

(*B*) EQUIPMENT IN RELATION TO TEACHING.

Modern and adequate equipment are absolutely necessary for efficient teaching. Unless adequate facilities for the diagnosis and treatment of disease are provided it is impossible for the clinical teacher to give adequate instruction in modern medicine, or to stimulate the interest of the students in the practical application of the instruction that they have previously received in their earlier subjects. We shall refer briefly to the changes we think necessary for improving the facilities for teaching, and for the adequate treatment of patients in the Infirmary.

1. *Dental Department.*—In a hospital of 900 beds a large number of patients suffer from septic conditions of the mouth, which may have a considerable bearing on the etiology of many diseases of unknown origin in the wards. This necessitates a larger staff of dental surgeons and greater facilities for treating patients in the hospital. The staff has recently submitted to the manager a scheme for improving this department, which, if carried out, will modernise the teaching and make it more effective.

2. *Massage and Physical Therapeutics.*—The present arrangements for the treatment of patients are unsatisfactory alike from the point of view of the patients and the students. Recently the assistant physicians submitted a memorandum on this subject. If the scheme proposed in this memorandum is carried into effect, facilities will be available both for the efficient treatment of the patients and for giving the students a reasonable minimum of instruction in this important subject.

3. *Balneological Department.*—This department is at present in abeyance on account of the war. Its equipment and organisation in pre-war days was not such as to allow any adequate instruction in the subject being available for students. The complete reorganisation of the department is essential.

4. *Facilities for Bacteriological Investigation.*—Much consideration has been given by the assistant physicians in the course of the past year to this subject, and, as a result, a report, representing the unanimous opinion and recommendations of the assistant physicians, was recently submitted to their senior colleagues for their consideration. In this report it was pointed out that while the appointment of a clinical pathologist, five years ago, had greatly increased the efficiency of the work done in the institution, the great development of bacteriological science in relation to clinical medicine now necessitates a further extension of facilities for clinical investigation. This report included the following observations:—

"BACTERIOLOGICAL INVESTIGATION IN MEDICINE.

"Every physician is daily brought in contact with many diseases, the cause of which is unknown, and the results of treatment of which are extremely unsatisfactory. As examples, we may cite rheumatoid arthritis, pernicious anæmia, certain forms of nephritis, and of disorder of the intestinal tract. The defects of our present knowledge of the diagnosis and treatment of these disorders, and of the conditions of their development, make it essential that increased facilities be obtainable for their more special investigation, and for the teaching of the students.

"There are many chemical problems in connection with the examination of pathological secretions—notably the urine, effusions into the pleural and peritoneal cavities, and cerebro-spinal fluid—as well as in disorders of respiration, blood conditions, and conditions of metabolism, that cannot be adequately observed under existing conditions. If the data required for a diagnosis according to modern methods are to be available, additional expert assistance from the chemical standpoint is a necessity.

"It is impossible for the present staff of the pathological department to overtake fully the investigation of problems which require extended observations. For this purpose it is necessary that the clinicians who require to make such observations should be provided with assistants for this purpose. It is suggested that the Infirmary Board should agree to appoint honorary officers, who should be graduates in medicine, with a recognised status. An appropriate name for these officers would be Clinical Observers. The officer would be appointed by the Infirmary Board on the application of a member of the clinical staff. His duties would be to investigate definite problems under the direction of the clinician who makes the application. The co-operation of the professors of pathology, bacteriology, or medical chemistry would be available in cases where the investigation involved the application of special laboratory methods, and they would direct the investigations in their respective laboratories. The clinical observer should not be responsible for routine observations in the wards.

"In addition to the assistant pathologist and assistant clinical pathologist, there should be an assistant chemical pathologist to assist the clinicians with the problems that arise in the diagnosis of cases requiring investigation from the chemical standpoint. The investigations would be carried out in the wards, side-room, clinical laboratory, and pathological department. Where necessary, further inquiries might be continued in the laboratories of the University and Royal College of Physicians."

The assistant physicians are of opinion that unless steps are taken to correct the existing defects in the equipment referred to above, the teaching of clinical medicine will remain unsatisfactory.

5. *Radiography.*—The general arrangements of the department call for revision in the interest both of the patient and the student. Amplification of the facilities for diagnosis and treatment are necessary, and increased opportunities for regular instruction of the students ought to be made.

6. *Ward for Alcoholism, Poisoning, and Mental Derangement.*—The

clinical material in this ward should be more utilised for teaching. Some arrangement is desirable whereby the University Lecturer on Mental Diseases might be associated with the Infirmary in a consultative capacity, and, acting in co-operation with the physician in charge, give an occasional lecture or clinique on the mental cases that bulk largely in the ward. This would tend to bring the subject of mental disorders into closer touch with general medicine. It is also desirable that the indoor arrangements for this ward should be reorganised, a special ward for incipient mental cases being established.

If the general scheme outlined in the foregoing, regarding teaching arrangements and equipment, is brought into operation, the efficiency of the medical teaching will, in our view, be greatly increased. In addition to this, however, there will accrue the further advantage of really useful clinical records being obtained. It is probably no exaggeration to say that the clinical records of the medical cases in hospital are, from the point of view of progress in medical knowledge, of small value. For reasons we have touched upon, they are necessarily incomplete, and therefore can be of little use, either now or in the future, as an aid to advancing our knowledge of medicine. In the discussion on Pathology an account was given of the admirable arrangements that were made by the pathologist for teaching the student to correlate the post-mortem appearances with the clinical findings. It would clearly be a great advantage to the teaching in the school if some uniform plan could be arranged whereby the clinical records of cases could be made more serviceable both for present need and for future reference.

DISCUSSION.

Dr. Mackie White.—In Dundee we look upon ourselves as an offshoot of Edinburgh. We try to carry out the traditions which were instilled into us so many years ago. My colleague, Dr. Stalker, and myself have had the teaching of medicine there for some years. Our school has about twenty-five to thirty students in the two final years, and we still adhere to the system of having medicine for the first time in the fourth year, with one exception, that recently during the summer term of the third year the elements of physical diagnosis have been taught—the groundwork which Professor Russell has so strongly insisted upon as being necessary to clear the way for the teaching of clinical medicine. During our time together Dr. Stalker and I have taken the seniors and the juniors for bedside teaching alternately. By this means we can to a certain extent differentiate in regard to the kind of instruction to be given in our cliniques. Besides the bedside cliniques we give one lecture a week to the whole class, and there, of course, the juniors have perhaps just to pick up what they can, because we cannot give the most elementary instruction to the seniors. At the same time one must always remember that in the seniors you meet at times the most appalling ignorance of facts impressed again and again upon them.

The papers we have listened to to-night seem to me to be extremely helpful in regard to the future of this school. The advantages of a small school like ours are evident enough, *i.e.* we know practically the capacity of every single student intimately, and are able in going round the wards or in bedside teaching to direct our instruction to a certain extent towards individuals. Of course real individual teaching is impossible, *i.e.* the kind of teaching that the house physician gets when he is on for six months with a visiting physician. The ordinary house physician will frankly tell you that he has learned more in three months than in all his course before. Just now, when so many of our young medicals are called away to the war, we have to use very largely the senior students as house physicians, to their very great advantage in some respects, although in others it is a disadvantage. I have been in the way of giving three or four beds to each of the seniors, for which they are held responsible, for which they get up the cases, describe them to the class, do all the investigations that the house physician ordinarily does, and follow them in fact to the time of their discharge. It is certainly very useful to the men, and it is a method practically carried out by Sir William Osler in the Johns Hopkins Hospital. He had a chance of organising the teaching of medicine in the Johns Hopkins University from the very start, and in his book *Equanimitas*—one of the most charming books in medicine—he describes how in the third and fourth years—the final terms then—he arranged the scheme of teaching. Of course it was done regardless of expense. He had graduate assistants such as they have in Germany—men who had devoted several years of their lives to hospital work—and he utilised the out-patients in the way adumbrated in the papers to-night. We give the out-patient instruction in the fourth year—many think it would be better in the fifth year, because it ought not to be taught quite so systematically as the bedside teaching of the wards. Osler, of course, had a very efficient bacteriological and clinical pathological department, every student having his seat and his microscope, with opportunities for doing all sorts of clinical pathological investigations which are so frequently lacking here. That is a thing I think we should aim at in Dundee. I imagine you do so here.

PROFESSOR HARVEY LITTLEJOHN.—The speakers to-night have to some extent forgotten that we are confined in a very important direction. Our curriculum is a five-years' one, and unless that time is increased it is not possible to get everything we desire into it. We must do justice as far as we can to the various compulsory subjects which are put in that curriculum by the General Medical Council. We agree, I suppose, almost *in toto* with the scheme sketched out by Dr. Matthew, and for post-graduate teaching nothing could be more admirable. But is it possible to utilise all the appliances suggested for the Infirmary in his paper in the teaching of the elementary medicine we have to give our undergraduates? I do not think it is. Our object must be to teach them, in the short space of time at our disposal, the essential facts of medicine, and try and make them as far as possible good, reliable general practitioners.

I do not think it very much matters in regard to systematic medicine—but this is subject, of course, to what the pathologist may say—whether it is in the third or the fourth year. At the special request of the teachers of clinical medicine to the Faculty the transposition of medicine was made from the fourth to the third year, one of the reasons given being that it would combine better with pathology than did surgery in the third year. I personally agree that medicine is better placed in the third year, and that the student ought then to get an insight into the elements of medicine, which will be of great advantage to him afterwards in connection with his study of surgical cases. It is no argument to say that it is too early in his course, and that by the time the final examination comes he has forgotten it. He ought not to have forgotten it, because, though he has his systematic medicine in the third winter, the whole of his time thereafter is associated with clinical medicine—and clinical medicine *is* the teaching of medicine. Systematic medicine ought simply to be giving the student a general outline of various diseases. My idea of systematic lecturing is that the lecturer should be simply like a guide taking a number of people round a picture-gallery, devoting the greater part of the time to those pictures which are standards in art. He should point out the characters of all the pictures, but devote special attention to those which really may be taken as outstanding types. By this means the student would get a view of the whole subject, not sufficient to make him a complete physician, but sufficient to carry him on throughout the rest of his curriculum, and to be a material help in what one might say was the more advanced teaching which he gets when he attends clinical medicine. I, therefore, do not agree that in taking systematic lectures in the third year the student loses touch with the subject for his final examination ; he continues the study by attending nine, and generally twelve, months of clinical medicine.

In regard to clinical medicine, had it not been for the war a great many of the suggestions made here to-night would have been carried out. Indeed the scheme mentioned by Dr. Gulland was in the minds of many of us long before it was put on paper, and it was the intention of the Faculty of Medicine to try and effect more efficient teaching all round, especially in the clinical subjects.

Too little is made of the great advantages which already exist for clinical medicine instruction. I do not think they are fully appreciated : we have in the Infirmary seven separate units, consisting of a chief physician, an assistant physician, a tutor, and house physicians. It is now a most important factor that each such unit is complete in itself, and that the number of students is limited as far as possible, so that a staff of at any rate four members have only a certain number of students under their control for clinical instruction. It is up to us, therefore, to see that those students are efficiently taught. It is a great pity that almost every student now, when asked what he is going to do after he graduates, says at once that he is going in for surgery. Why? Because he has been enthused by the surgeons. I think it is to be regretted that the physicians cannot get such a hold of the student of the present day as to make him as keen on the practice of medicine. I cannot help believing that this circumstance has something to do with the way that clinical medicine is taught. We are told in Dr. Matthew's paper that he wants more money spent on clinical apparatus, but he does not mention that £600 was paid by the university four years ago for providing clinical appliances, microscopes, etc., nor that special tutorial rooms at the request of the physicians were provided, equipped, and intended to be used in the elementary teaching of the students in testing urines and other chemical methods.

Dr. Gulland lays too much stress, in my opinion, for a professor of medicine, on examinations. We must not bow to the desire of the student and give him lectures or notes which are going to be useful simply for examination purposes. It is the duty of the teachers to give him the teaching that they think best for him, without any thought as to the examination, and when the examination comes, to make it a practical one which will test his knowledge fairly.

It is one of the great desires of the Faculty that we should get the Dispensaries to work in very close conjunction with the teaching of practical medicine in the university. It cannot be done without the loyal co-operation and help of the physicians who are attached to these institutions. It is a question of money, and very properly there must be some remuneration: one of the difficulties will be to provide sufficient remuneration. Still, I do hope that after the war we will be able to have a conference and try, all of us who are interested in the school, to put the Dispensary back again to the important place which it held in the practical training of our students.

Dr. Thin.—We have heard a great deal to-night about the improvement that ought to be made in the practice of physic. I speak from the point of view of the general practitioner, whose lifework it is to put into actual practice the lessons learned in the medical school, and to elaborate and improve them as he goes along. The scheme we have of giving one hundred lectures ought to be to a considerable extent scrapped. These lectures are a relic of mediæval times, when books were non-existent or were too expensive to be in the hands of students. Now, we have a number of quite good text-books, any one of which might be used by the students as the basis of the work. A considerable amount of time could be saved if the student were made to utilise the text-book as it ought to be used. The time now used for the one hundred lectures might with more advantage be spent in the hospital, the ward, the clinical theatre, or the out-patient department. Particularly I would emphasise the necessity of the senior student being made to attend the out-patient department regularly. The men should learn at the out-patient department the mode of treatment of the minor complaints and of the beginnings of disease, the earliest features of the diseases of which they see the full-blown article later on in the wards. The student ought to get some training in certain aspects of psychology, apart from what is concerned with the department of the insane. While we teach the student all we can about the anatomy and the functions of the body, we leave out absolutely the functions of the brain and mind. These functions are a most important factor in the origin of many illnesses and in the treatment of the individual when ill. There are a great many ailments which may be called functional diseases and hysterical conditions which are only to be elucidated along the lines of psychology. The method of attacking these at the present moment is no great credit to our profession.

Dr. Fleming.—I do not agree that we ought to have fewer than one hundred lectures, because I think that a course of systematic medicine should be a collection of types of disease which should be given to the student not necessarily before he enters the ward, but as a guide to him when he gets there, and no text-book can replace the remarks which a good lecturer on systematic medicine can make. If you are going to say that systematic medicine is not necessary, then obviously systematic surgery is not necessary; systematic pathology—I do not know where you would end. You are going to eliminate the teacher except as a practical demonstrator. I used to believe that note-taking is bad, but I am certain that if you want to remember anything you will do so best if you write it down. I do not mean that the lecturer should dictate to the student, but I do think that good notes are essential. The association of the systematic and clinical teachers would be extremely valuable.

To my mind it is absolutely unsuitable that medicine should come in the third winter. If most of us were surgeons, I could see that surgery ought to hold the place it does in the fourth winter; but most of us are physicians, and unless we have a junior and a senior course of systematic medicine it is a mistake. Surgery appeals to the junior student, he likes putting on bandages and splints under direction, but the clinical teacher in medicine can also fascinate his students, and I do not agree that they are not enthusiastic about medicine.

As to case-taking, I believe that if in the Dispensary, where the student gets the chance of having a number of cases under his care, the Dispensary doctor's attitude was to see that all these cases had reasonable notes made of them before the student got his certificate of attendance, he would be doing a great service. For junior students the physical signs and symptoms in health should be the first ground for clinical work, and after that should come case-taking.

It is a pity that we have so many special subjects; many of them might far better be post-graduate. A specialist is apt to give the student far too much. It would not be a good thing to diminish the number of clinical lectures by making still more special subjects.

Dr. Chalmers Watson.—The unanimous views of the assistant physicians have been by arrangement so fully presented in Dr. Matthew's paper that there is little room for elaboration, but perhaps I may be allowed to enlarge very briefly some of the points made in that paper in the light of the interesting recommendations made by Professor Russell and Professor Gulland, and also of the remarks made by Professor Littlejohn.

It cannot be gainsaid that the status of the medical school depends infinitely more on the standard of efficiency set by the thirty clinical teachers of medicine and surgery than on the work of the relatively few teachers in the earlier systematic subjects. The first point that arises is, whether or not there has been any deterioration in the standard of efficiency in the school. When I compare the teaching and the work done by medical students twenty-five years ago—there were over one hundred students in Sir Thomas Fraser's clinique at that time—I am quite convinced that the interest which the students took in their work, the amount of time that they devoted to their practical work, and their practical efficiency on graduation, were considerably greater than at the present time. It is exceedingly difficult accurately to apportion the blame for this state of affairs. It is, in my opinion, due in part to defects in the teaching, and in part to the multiplication of classes and a lack of proper co-ordination of effort on the part of the teachers in relation to the student's curriculum.

There are numerous suggestions of a practical kind in Dr. Matthew's paper which, if effectively carried out, would in our view greatly increase the efficiency of the teaching. In the opinion of the assistant physicians one of the main factors which have contributed to the lessening of the standard of efficiency in teaching is the absence of adequate facilities for the diagnosis of disease, and for its treatment from the modern standpoint. The crux of our position is embodied in the statement that, "whereas there have been many important advances in our knowledge of the diagnosis and treatment of disease in recent years, there has been no corresponding development in the equipment and facilities available in the hospital." Recent graduates of medicine, who have compared the facilities available and the teaching with those in other schools, have come quite correctly to the view that the teaching in their old school falls, in certain directions, materially short of modern requirements.

Professor Littlejohn has asked a very important question, viz. Is the scheme suggested in Dr. Matthew's paper a practical one for the teaching of medical students? In our view, it is not only possible but essential. One of the reasons for the absence of enthusiasm in medicine shown by medical students, to which Professor Littlejohn has referred, is the fact that the students are continuously seeing cases of chronic disease remaining in hospital for weeks or months, and then leaving very much *in statu quo.* We do not make adequate use of the methods of modern diagnosis as to the nature of these affections; we are too content to make use of the facilities for the diagnosis and treatment of these disorders which were available in our own student days. Personally, I do not wonder that the present-day young graduate wishes to direct his time and energy to surgery in preference to medicine.

We cannot discuss the subject of efficient teaching without reference to the subject of scientific research. Professor Gulland tells us that the modern text-book is no sooner issued than it is out of date because of the advances in modern medicine. In that statement we find a clear, a definite, and a correct expression of opinion, showing the interdependence of teaching and clinical research. Any discussion on the efficient teaching of medicine at the present time is therefore comparatively futile unless adequate consideration is given to this important subject.

I wish to refer to another point which bears directly on efficiency in teaching in the Edinburgh school. I think you will not get the maximum state of efficiency until you improve the status of the assistant physician. Until a few months ago the assistant physicians had no say whatever in the teaching arrangements of the school. Under such conditions a man of 45 or 50 years of age for the first time becomes an integral part of a system which he may think radically inefficient. Is it to be wondered at if he then succumbs along the line of least resistance—a line which is prejudicial to the interests of the school? This is a point of view which does not commend itself to our senior colleagues. Personally I can speak on it more freely because, but for the war, I would now be a senior physician. I am so impressed with the importance of this subject in relation to efficient teaching, that so long as the junior physicians make the claim for their complete inclusion on the Clinical Medicine Board, I will do everything possible to support their application. If it is competent for the committee of this Club to deal with any recommendations on the subject, I strongly urge that they put forward as a definite recommendation that lecturers of clinical medicine be *ex-officio* members of the Clinical Medicine Board. I am perfectly sure that would make for much greater efficiency, and that it would tend to promote in a fuller degree the co-operation which is required. That could be done without in the slightest degree infringing the supreme authority of the chief of the ward.

In consideration of the views expressed by the assistant physicians in Dr. Matthew's paper as to the important influence which our defective equipment and outlook generally has had on the efficiency in clinical teaching, I would like to ask Professor Russell whether he agrees with us that efficiency in teaching necessarily involves equipment of a modern kind; that we have been too long content with a standard of equipment which falls below the minimum required; and does he agree that he, like us, has important responsibilities in regard to the correction of these defects as quickly as possible?

At the present time the Edinburgh school has a magnificent opportunity for reconstruction. That reconstruction will only attain a satisfactory level if a new atmosphere arises—one permeated by a spirit of progress. I have on many occasions discussed with my senior colleagues the problems raised in the paper, and I have never found any substantial difference of opinion between us. The curious thing is that nothing whatever is done either individually or collectively. In connection with all the schemes of reconstruction arising out of the war, a very important place must be given to medical education and the advance of medical science in its curative and preventive aspects, and if we are to make full use of our opportunities, we must seek to develop the new atmosphere required. If this is accomplished, the unique opportunities afforded the clinical teachers might surely go a long way to restoring the Edinburgh school to the proud position which it formerly occupied as the leading centre of medical education and medical practice in the kingdom.

DR. LOGAN TURNER.—I feel it my duty to put in a word for the greater utilisation of the younger men in the school as teachers. Twelve years ago, when I was appointed a senior surgeon in the Ear and Throat Department, I at once saw that that part of the teaching should be essentially developed, and I had not any hesitation in utilising all my junior staff and making them very nearly share and share alike with myself. I think Dr. Fraser will bear me out when I say that he has been utilised, sometimes perhaps more than he liked, in the teaching. Then as to the younger men having a share in the utilisation of the wards. We cannot expect men to teach and do the heavy work unless they also get the facilities they deserve. As regards the question of research, to my mind the good teacher must also be a man who conducts his own research, and in the Ear and Throat Department this has been carried out in a valuable way. One has not confined one's desire to encourage research in the assistant staff; the clinical assistants also as far as possible have been encouraged to do research work, and up to the outbreak of war they have contributed annually to the Reports of the Department. If this can be done in a small department, it can surely be done in the larger departments of the Infirmary. I hold that the school would benefit by reducing the size of the cliniques, by training men while they are still comparatively young into better teachers more fitted for senior posts.

DR. RAINY.—I agree with Professor Russell that the senior teachers might in ordinary times take a larger share in teaching the elements than they do. I have tried that with great advantage. We quite realise the importance of complete co-ordination; and I would only say that, as an assistant physician who, owing to various accidental causes, has worked under six chiefs in his time, the majority of these were quite willing to utilise one to the full. A little more systematising of clinical medicine would be an advantage. I was struck in Vienna with the way in which they managed to run systematic courses in clinical medicine and in the special subjects. Co-ordination and co-operation in the different wards might help us to a considerable extent in developing that side. We are too much individual units in the Infirmary. When I was attached to the Sick Children's Hospital I felt very much that there was a different atmosphere—that the staff, in fact, worked all the time as a whole.

There is a very definite place for the systematic lectures, but I do not know that the present system, to which we are more or less bound by ordinances and other things, is altogether ideal. I would much prefer, as in certain other subjects, to see medicine divided so that juniors might attend three days a week for thirty or forty lectures, and seniors attend two days a week; so that the juniors would get the fundamental details given them, and then the senior course could fill in gaps and treat of matters which would be much more appreciated by students of more clinical experience than third-year men can possibly have had.

With the paper by Dr. Matthew I am practically in accord. We do want to bring in the special departments—balneology, massage, and so on—and to make them much more practically in evidence for the students. Before long we may get a certain amount done in that direction.

With regard to the preference to surgery over medicine, it is dangled in front of students that in surgery the fees are bigger, which constitutes a definite point in its favour, but there is also the fact that somehow there is more of a feeling of progress in surgery of late years than we can claim in medicine. I do not think that will continue indefinitely, and I hope that before long the physicians will have their innings again.

In the ward for delirious patients, arrangements should certainly in some respects be altered. It does not follow by any means that the teaching of psychological medicine in that ward can be conducted by a man whose interests may lie in any other branch of medicine. It would be well to associate with him some man with special experience in work of this kind.

Mr. Miles.—Professor Russell very rightly regretted that the student did not reach clinical work until the third year, when he arrived in what the professor described as a "virgin state of mind" as to all matters clinical. Is it not possible that the student should enter the hospital somehow before his third year? It is absurd that after studying anatomy and physiology for two years he should arrive at the hospital knowing nothing whatever about the bearing of these things on medicine. Professor Russell said that the systematic lecture should be something very much better than a text-book; I would put it that it should be something very different from a text-book. Each has its proper *rôle* in the teaching of students. The lecturer should expound the text-book, and to that extent be better than it, but the two are essentially different. The taking of notes can be of little use; the student so often takes down the wrong things, and would get at the subject much better from a text-book. Provide the text-book and expound it—there you have the proper combination.

Professor Ritchie.—The discussion to-night has dealt largely with two different things—the present teaching of medicine and its defects, and the ideal teaching of medicine. With regard to the first, we are undoubtedly at the present time handicapped in various ways—one of these being that medical students do not all commence their course at the same time. Some commence three months before others, and ultimately these two groups come together and dealing with them constitutes a serious practical problem. One of the things the committee of this Club will have to consider in their report is whether the time has not come for a reconsideration of this matter with a view to laying down one curriculum which shall be commenced at a certain time of the year, and which shall be followed in an orderly way throughout. One of the results of the present unfortunate defect is that, if the student commences his work in the summer term, he has practically nothing to do in his fourth summer, and a great many of our students—as is well known—go away from the university for three months because they have not sufficient employment here. Might not this summer be used for giving the men instruction in those special subjects as raised in the paper by the assistant physicians, thus converting what is largely at the present time a waste period into a period fruitful in turning out better clinicians?

Various speakers have raised the question of the fact that the students have to crowd too much work into a very brief space of time, and that therefore they have not the opportunities for clinical observation which they ought to have. I remember eight or nine years ago, when this subject was last discussed by the Club, that the committee, of which I was a member, had evidence of a great change which had come over the practice of students of the school since they (the members of the committee) had been students themselves, viz. that the students did not spend so much time in the Infirmary in the evening as formerly. I have not heard whether this has been altered, but I fancy not, and I think that the Managers of the Royal Infirmary cannot be considered entirely blameless in the matter; nor can the teachers of the medical school be considered blameless, in that at the time when the managers limited the hours of attendance of students in the evening they did not make a strong protest against the change. When I was a student we spent long periods in the Infirmary in the evening. In many respects they were the most fruitful periods of our clinical work; we came round and made observations for ourselves on the patients, and this tended also to make the position of the house physician or house surgeon a more important one, because he was expected by his chief to take an integral part in the teaching of the students in directing them in these observations. This point should be borne in mind with a view to some return to the old system. The argument that the patients suffer will not hold water. The patients used to be glad to see the students in the evening; it relieved the tedium of their existence to a certain degree, and I am certain that when the wards were properly under the control of a competent house physician, no harm resulted to the patients.

Some of these points may be remedied to a certain extent, and, I hope, more time given to the student in his earlier years for his clinical work and for following up those developments which have been referred to in

Dr. Matthew's paper. I trust that the earlier part of the course may be lightened of some of the scientific work, and that we may gain in that way sufficient time, even in the short period of five years, to send out the student a more competent general practitioner than is the case to-day. This is a matter which requires immediate attention. It is a uniform experience that, so far as the scientific teaching of medicine is concerned, the medical student of Edinburgh still goes out into the world probably the best equipped student as compared with any other of the medical schools.

With regard to what might be called the ideal course in medicine, we all agree that the lines laid down by Dr. Matthew in his paper are the lines which must be followed in the future development of the school. We must have better equipment and a better organised system of the teaching of special subjects. I do not think it is inconsistent with our turning out general practitioners that we should give them a great deal more experience of special methods than we do at present. Certainly the development of such a scheme as Dr. Matthew has sketched would inevitably lead to a greater development in research in medicine in this school, without which development the health of the school cannot be maintained.

At the present time there are two great obstacles to the development of the school. The first is the question of money. When the proposals brought forward by the assistant physicians were originally submitted to the Board of Managers of the Royal Infirmary, the managers were in the greatest sympathy with them. If they had had the money they would undoubtedly have proceeded at once to the reconstruction of the medical electric department, to the reconstruction of the balneological department, and they would have provided a department of physical therapeutics. But it was pointed out that to embark upon this scheme would probably require £60,000, and the managers simply had not this money, and saw no prospect of getting it. The second is the size of the school. That is a difficult problem. There is no doubt that the Edinburgh school would be more efficient if it had fewer students. The clinical facilities in Edinburgh are, after all, limited. Further, the teaching staff of the Infirmary must, from the fact that the population of Edinburgh is not very great and from the fact that Edinburgh is not an industrial centre, be drawn from only the limited number of men available for teaching posts, so long as such men must rely on private practice for a livelihood. If this school is to become the greatest medical school in the British Empire, we must take such steps as shall result in our getting, not an increase of numbers, but an improved type of students into the school. We are all at one in believing that the time has come when fresh developments must be made, and the discussion to-night has laid down in a broad way the lines that those developments must follow.

Dr. C. B. Ker.—Do Dr. Matthew and the assistant physicians think that the addition of extra side-room work, with perhaps more or less complicated apparatus and things of that sort, will not necessitate a longer curriculum, because some of us think that there is little enough time, so far as we can judge, for purely clinical and bedside instruction? From my own experience, my view is that the student is sometimes apt to get hypnotised by elaborate side-room methods to the exclusion of the patient himself. We should all be glad to see an extension of the things the assistant physicians are asking for if they do not consist in an addition to the curriculum. I think if there is any subject in which the whole hundred lectures are required it is medicine.

Dr. James Miller.—One has come in contact with case-taking as a resident, and more recently in the department of morbid anatomy under the new system of teaching that subject, and one's conclusion in regard to the taking of cases is that it is unsatisfactory. That results from two main causes—one a want of interest on the part of the student himself, and the other a want of superintendence on the part of someone skilled. The superintendence which he gets is that of the house physician, unless his case comes up for a clinique, when it gets criticised by the physician; yet that case will form practically the only record which there is for the purposes of the Infirmary. The suggestion I would make as regards this state of affairs is first of all that the students should have a certain number of cases to take, and the marks they get for them will count in the class of systematic medicine and in the professional examination. Further, that associated with the case-taking there should be a summary or critical survey of the whole case co-ordination—the pathological, clinical, and therapeutic aspects.

Dr. Ivy Mackenzie.—Professor Russell began with a clear and simple exposition of the method in which the subject ought to be taught, and we have wandered from that into the region of administration. It would be a very good thing for any medical school to be organised along the lines suggested by Dr. Matthew; but I am not sure that it would be of the greatest benefit to the students, because the student ought to be taught only the elements of medicine and the method of looking at medical problems very early in his course. I do not see why that should not begin in the first year of medicine. A student ought to be saturated with the impressions that come from looking at sick people, and that cannot be begun too early in his course. He ought to be taught very early how to look at the pupils, at the skin, at the respirations—the things that the nurse has to put down in her day and night report. Any physician who has a good sister in a ward knows how much she knows about medicine without knowing anything about the technical terms used in pathology.

With regard to the question of systematic lectures, looking back on my own experience, I remember that one of my lecturers held his ordinary clinical lectures two or three days a week. He then gave his special systematic lecture, and in it he dealt in a systematic fashion with the subject which he had been demonstrating in its minute details during the rest of the week. That is my idea of systematic work. Dr. Gulland could not go over the subject in three hundred lectures in a way to satisfy himself. In a few lectures he has to deal with the subject in a manner which will produce such an impression on the student that when he goes out into the world he will have a definite method of looking at illness.

Dr. Thin suggested that the students ought to be taught psychological medicine. That is a most important thing. Psychological medicine as a rule is devoted to people who are hopelessly insane, and the student is not sufficiently impressed with the fact that there is a very definite distinction between disease and illness, *i.e.* that an anatomical change is not reflected every time in the same form of illness, that every complaint referable to an anatomical change has first of all to come through the consciousness of the sufferer; and the students in the practice of their art ought to be taught that it is their business to connect the nature of the illness with the brain, through which it comes. The psychological element of suffering comes into the most chronic maladies.

With regard to the relation of pathology to clinical medicine, I think, speaking from the point of view of clinical medicine, that on the staff of our wards there ought to be one member definitely associated with the pathology department. It is the case in some of the London hospitals that one of the juniors takes the assistant pathological work and helps the pathologist in the post-mortems that come from the wards; he assists the professor of pathology, and demonstrates to the students the relations between the pathological changes and the clinical phenomena observed in the wards.

Professor Lorrain Smith.—The teaching of physiology might as far as possible be brought into the Infirmary and brought to bear on the cases there, so that it could be a real introduction to medicine. The same should be the case with anatomy and pathology. We have tried to carry out this co-ordination lately by making the main part of our course the teaching of how the story of disease in a given case is to be read in pathology in correspondence with the clinical observations and history of the case, making the study of pathology as far as possible an introduction to the subjects of medicine and surgery. By thus co-ordinating the work of these departments a great deal of introductory matter could be got over, and physiology, anatomy, and pathology could be made more interesting to the students, who would arrive at medicine not unfamiliar with the living patient. We have found in pathology that systematic lectures are of comparatively little importance to the student until he has a basis on which to build. To give a course of systematic lectures, and say, "Those are the general principles; go and apply them," is more or less a futile effort in the direction of teaching. We have found it more successful to give the men a very short introduction to the subject, and then send them to study that subject under expert teachers in living cases. Having studied it so, they come back and listen to a systematic lecture such as that to which Dr. Ivy Mackenzie has referred. I should like to suggest that in teaching pathology and medicine together we should have the co-ordination which I think every teacher has mentioned between the wards and the pathology department, the physiology department—indeed, every department possible. We should have our introductory course of lectures, say on the heart, and then adjourn to the wards to study heart cases there, and after our students have seen a series of heart cases both pathologically and clinically, we should reassemble the matter in their systematic course and expound what science has to say in the interpretation of these cases. I should like to hear what Professor Russell and Dr. Gulland would say to this method of teaching. As for reading, of course there is a large percentage of men who stubbornly refuse to read. But the better men seem to read everything: one is sometimes overwhelmed by the amount they get through. I firmly believe that, without providing the concrete basis on which to build systematic teaching, systematic teaching is to a large extent a futile effort as far as most of the students are concerned.

Professor Russell said in reply.—There was quite a difference of opinion as to the transposition of medicine and surgery in the curriculum. My experience is that this new arrangement has not been difficult. But that is perhaps because I have the advantage of having been trained as a pathologist as well as a physician, and that I never think of teaching medicine without in the first place clearly, however briefly, pointing out the pathological condition that is giving rise to the symptoms and to the physical phenomena.

The alteration suggested by Dr. Gulland is a good one, viz. that systematic medicine might be broken up into two courses, and that there might be a rapid survey of the various systems during the first term that the student is at clinical medicine.

With reference to Dr. Ritchie's remarks, there is a great deal to be said in favour of the University Court determining that students should begin their course either in winter or in summer. I say, let them begin in winter. The student who begins in winter and has done human anatomy comes to zoology with a much wider understanding and derives more benefit from it. They might begin their clinical medicine in the summer after the second winter. With a knowledge of physiology and anatomy, and with very elementary instruction in pathology, there is not much difficulty in teaching them physical signs during a single term. I lay strong emphasis upon the fact, however, that that cannot be done to a class of more than twenty or twenty-five. In the old days we went a great deal more to the Infirmary in the evening. The time of the student was not nearly so occupied as it is now. My contention has always been that with the suggested extra year much more might be done in this direction. The enthusiasm of the men for surgery has been very largely the result of the enormous advance made in abdominal surgery, which has overshadowed any advance in medicine since Lister's introduction of antiseptic medicine and surgery. Also the operative procedure appeals to the student because he likes to use his hands. But I can assure you that my students have been very enthusiastic this winter, owing perhaps to the intensive teaching in medicine that I have been able to give them during the first term, and I shall be very surprised if I have not given them such a view of medical methods and systems as will keep their fancy attracted to medicine instead of drawing them away to the glories of surgical operation.

Dr. Gulland said in reply.—The student will read if you interest him in the subject, but he will not deliberately read through a text-book for the sake of mental improvement. It was interesting to me to find that the assistant physicians and the Faculty have come to practically the same finding as to the way in which the services of the assistant physician should be utilised. As regards the systematic teaching, I should be thankful to have the number of lectures diminished, but I cannot see that it is altogether necessary to have a separate course on dietetics. Medical ethics are taught by the professor of medical jurisprudence. As regards the question of hospital equipment, the physicians are entirely in sympathy with the assistant physicians. There are a great many things in the matter of equipment that must be done.

The co-ordination of subjects as suggested to-night is a delightful prospect. The real difficulty just now with the teaching of physiology and anatomy is that the really important points are not impressed upon the students. That the anatomists should have the long time that they do have, and succeed in getting no more than they do out of the students is unfortunate, and the same is true of physiology. I think the teaching of pathology is most admirable, but my point is this, that you make it so interesting that it draws the students' attention away from clinical medicine.

Professor Lorrain Smith.—It is directing it towards it.

XXVI.—THE ESSENTIALS OF SURGICAL TEACHING.

By G. GREY TURNER, Major, R.A.M.C.(T.), Hon. Assistant Surgeon,
Royal Victoria Infirmary, Newcastle-on-Tyne.

I GREATLY value the opportunity of being present at your discussion to-night, and I am looking forward to hearing the views of those of you who are the custodians of the great reputation for surgical teaching which the Edinburgh school enjoys.

If it is admitted that there must be some reform in the methods of surgical teaching, I realise that the conditions and the requirements vary. My remarks probably reflect the peculiarities and defects of my own school, while any suggestions are an expression of my personal hopes and aspirations. But as I take it this discussion does not concern the affairs of any one school, I have tried to define certain principles which may serve as a basis on which any teaching scheme may be founded.

Forgive me if I speak dogmatically on debatable points, for it is either from strong conviction or in order to furnish definite grounds for discussion. If my remarks help to stimulate a free interchange of opinion my object will have been served.

At the outset I am sure we all realise that the duty of teaching can only be superadded to the primary function of any great hospital, but a well-organised teaching scheme can only add to its efficiency for the cure and alleviation of injury and disease. As the State may have to help the teaching bodies much more handsomely than ever before, the public must be made to appreciate the great advantages of a Medical School, and we must never lose an opportunity of bringing this matter before the governing bodies. The war has furnished a splendid object-lesson, for what would the hospitals have done without the help of their students!

I take it that our object is to turn out good all-round men, who will take their places among the ranks of the general practitioners, the most important members of the medical community and often the flower of the profession. I hold very strongly that the education of those who wish to specialise in surgery ought to be entirely in addition to what is provided in the ordinary course and should be post-graduate. No one should be allowed to practise as an operating surgeon unless he can produce evidence of some such special preparation. This is due to the public, for at present anyone who has passed a qualifying examination may essay to undertake the operative treatment of the most serious and important surgical conditions without any guarantee as to his fitness. The State must assume the responsibility of making the necessary regulations, but the teaching bodies must see to it that any graduate with special aptitude should be able to command a proper training.

Let us consider what we have to teach. When I think of the curriculum of the present-day student I am appalled at the number of subjects which he is supposed to master, and deplore the amount of detail with which he has to burden his mind. On account of the number of ancillary subjects which have been introduced—and made compulsory—during the last decade or so the limited time of the student is too much divided up and too little of it is available for what are admittedly the principal objects of study. So far as special subjects like ophthalmology, laryngology, dermatology, etc., are concerned it ought to be clearly recognised that no attempt should be made to teach them as though they were to be the life-work of the pupils, but only sufficiently to be an aid in general diagnosis and to prevent the commission of grave errors.

In every subject the student's task would be greatly lightened if we could so ground them in principles that their application would be easy and the knowledge gained would enable them to rely on their guidance rather than routine. There is a great tendency for students to "pigeon hole" their knowledge, and the methods of teaching largely in vogue rather exaggerate this fault. They think of inflammation in the appendix as something entirely different from inflammation in the lungs or the bones or the meninges. Or, even worse, they may only regard this process as an intricate subject taught in the pathology class and of academic rather than practical importance. I believe that a thorough grasp of the processes of inflammation is one of the foundations of surgical knowledge and that it should be fully taught from the clinical side in the surgical course. But the teacher must never lose an opportunity of pointing out that the essential changes in inflammation are the same and that differences depend largely on environment, and he must dispel the common idea that there is one variety for medical cases, another seen in the surgical wards, and yet another peculiar to the regions and diseases dealt with by the gynecologist.

Again, the student is too apt to look upon bacteriology as an abstract science, only to be studied in culture tubes and by high-power lenses, and it is our duty constantly to point out the relation of bacteria to disease processes and the behaviour of the living body in the presence of the invasion by bacteria or their products.

To take another illustration. If time be spent in thoroughly teaching the principles which govern the spread of malignant disease, then this knowledge, with an acquaintance with the anatomy of the region affected, will enable students intelligently to anticipate what may be expected to occur and what symptoms will be produced in malignant disease affecting such different parts as the parotid, the œsophagus, or the prostate rather than that they should, by a pure effort of memory associated with some one paragraph in some particular book, remember what the progress signs and symptoms may be. Similarly, it is most useful to consider the phenomena of vascular obstruction and to show how it is in principle the same whether the part involved be the gut in a strangulated hernia, the testicle subjected to torsion, or a limb the victim of too tight a bandage. These examples are sufficient to show what I have in mind, though numerous others will at once occur to you, perhaps as better illustrations.

The next and natural step in teaching is the illustration of the application of principles to diseases of regions, but this becomes the easier in just so far as the principles are thoroughly understood.

Then comes the recognition of the changes produced by injuries and disease—the recognition of physical signs. For this we require to cultivate the faculty of observation, and the *Adventures of Sherlock Holmes* is a useful text-book for this part of the course. I often deplore the fact that the distinguished author did not apply his great talents to the production of a work on diagnosis. George Murray Humphry's *dictum*, "Eyes first, hands next, ears last" is a sound guide, and if I had my way I would have his words painted in large letters in a prominent place on the wall of the clinical theatre. The value of a good method cannot be overrated, and I always have more hope for the future of a man who arrives at a wrong conclusion by a good method than of he who makes a brilliant diagnosis without any method at all. Then we have to try to teach students to think correctly and to draw sound conclusions from the observations they have made. Surgical pathology must not be divorced from surgical patients, and should be taught in connection with the work of the wards and theatres. In the days when I was surgical registrar it was part of my duty to make the post-mortem examinations on patients dying in the surgical wards. This was an excellent practice, and I always regret that it has been superseded just when the aid and advice of a skilled pathologist can be so readily obtained. For the student the examination in the dead-house and its laboratories should be the end of the lesson which began in the out-patient department or the receiving-room. There was some point in the notice which the wag stuck up to the effect that "Professor —— will deliver the Clinical Lecture in the Post-Mortem Room. Subject: 'Cases from the Wards.'" I would also earnestly plead that the teaching of gross surgical pathology is as important and useful as the study of the section by the microscope.

At this stage let me say a word about the teaching of operative surgery. I have already spoken of the education of those who intend to practise as consulting and operating surgeons exclusively. For them a comprehensive course of operative surgery is essential, but for the ordinary qualifying examination it is absurd to teach, and to expect the student to be familiar with, operations which he not only never sees but which are very rarely performed and which none but the most expert will ever be called upon to undertake. For this examination students should be thoroughly grounded in technique, in minor surgery, and in emergency surgery. Operations on the cadaver have their value, but they must be carefully and systematically performed and very carefully supervised or they become worthless and a great waste of scarce and valuable material.

I would suggest that much more use should be made of the operative work in the out-patient theatres and casualty rooms, for these are the very operations which the practitioner is frequently called upon to perform. I would also make the surgeon responsible for the teaching of his dressers in minor surgery. Emergency operations should be carefully demonstrated, and I have no patience with the ritual which keeps the spectators at too long an arm's length when such important work is in progress. Students should also be much more familiar with the indications for operations and with the after-history of operation cases, for it will be more their business as practitioners to know when an operation ought to be carried out and the results to be expected than to be *au courant* with the steps and varying methods of their performance.

To teach surgery then on the lines indicated I consider it essential (1st) To introduce the subject by a limited course of systematic lectures on principles. (2nd) To bring the student into the closest possible touch with patients and with disease. (3rd) To ensure continuity in the consideration of clinical surgery. (4th) To ascertain that each student really understands what he is taught.

I have never been able to see any essential difference between systematic and clinical surgery. In its practical bearings all surgery is clinical, and though a certain number of systematic lectures is undoubtedly necessary to teach the general principles and to co-ordinate the students' knowledge of the diseases and injuries of regions, I cannot see any reason for a set number of lectures—even as many as a hundred—when such excellent text-books are available for reference. It appears to me that teaching by set lectures is a survival of a past age, when books on surgery were few, and when men had to depend largely on notes copied at the dictation of some famous lecturer.

Now let me explain what I have in view when I speak of the importance of continuity in teaching. I believe it to be essential that students should watch the progress of the patients from the time they first apply to the hospital until they are either "relieved by art or released by death." The student cannot get a proper perspective of disease if his acquaintance ceases when the patient leaves the out-patient department for the ward or if it be first made in the operation theatre or afterwards. The best system of surgical teaching I have ever seen was that practised by the late Professor Theodor Kocher in his famous clinic of Berne. Every step in the diagnosis and treatment was elucidated before his class, and they were never allowed to lose touch with the patient during his progress through the hospital. Let us take as an illustration the case of a patient who came to the hospital complaining of difficulty in swallowing. The man was brought into the morning clinic and two students were selected to go into the case with Kocher as guide. On the first day a preliminary examination was made and the main points of the history were obtained while aneurysm and such conditions as gross secondary glands, etc., were eliminated. The further steps to be taken in the diagnosis were discussed and the patient was sent back to the ward. On the following day the patient again appeared, having been X-rayed with and without a bismuth meal and the larynx having been examined. The plates were shown and their value discussed. Bougies were then passed by one of the students under the direct guidance of the professor. The question of œsophagoscopic examination was dealt with, the method being explained and the instruments shown. Several points were illustrated by anatomical models and specimens from an adjoining museum. Finally, it was decided to perform gastrostomy, and the reason for the choice and the rationale of the operation were explained. On the morrow the students who had examined the case were present in the theatre when the operation was carried out, and on a subsequent day the patient was again brought into the clinic so that the whole class might see the gastrostomy and the process of feeding. Whenever possible, similar cases previously operated upon are shown, so that the class may be made familiar with the late results, and in the event of a fatal issue the organs are invariably brought into the clinic and explained by the professor. Of course each morning more than one case is shown and discussed, and it is often possible to deal with the whole subject there and then.

My fourth postulate presupposes the "Tutorial" class, a name unfortunately often looked upon as synonymous with "grind" or even "cram." It is the business of the teacher to see that his students thoroughly understand the subjects taught, and the principal use of the tutorial class is for revision and also for the teaching of such subjects as physical signs, bandaging, splints, instruments, etc., which can only be properly dealt with in small classes. These classes would be conducted by the assistants, but would be an essential and important part of the scheme.

To meet the requirements for teaching which I have outlined I believe it necessary to have special Teaching Clinics conducted on what is often called the continental plan, though I believe that it was originated in this city by Syme at Minto House. In addition we must certainly continue our own excellent system of education by clerkships and dresserships in the out-patient departments and wards, in this way fulfilling the requirements of my second postulate. All the students taking the surgical course would attend the lectures, demonstrations, and practice of the main clinic, but would also each act as clerks and dressers in the out-patient department and in the wards of the hospital generally and for the usual period.

The head of the scheme would be a Professor who would not only be an active teacher but the director of the teaching clinic. He should be a born teacher and educated to make it his life's work, and I would unhesitatingly declare that in the larger schools this post should be virtually a whole-time appointment. I say virtually, because I think it would not be fair to the professor or to the community to shut him out completely from consulting work, and that it would be better for the students if the man at the head should continue to have first-hand knowledge of the condition in which they would have to work. But his duties would only allow of his being called into consultation in very special cases, and there must be no question of competition with the men in active consulting work. So long as it is accepted in principle that the best of his energies and all the time necessary are to be devoted to the teaching clinic, then what private work he may do becomes a matter of easy arrangement. In some schools abroad the fees for any private work go to the funds of the clinic, and I suppose in return any patients are seen and operated upon in private wards. This I should look upon as an admirable arrangement, provided that, if especially useful, such cases might be brought into the clinic for demonstration.

But the duties of the clinic would come first and would occupy the whole of each morning, and the best part of the evening would have to be devoted to preparation, organisation, or study. The man to be at the head of such a clinic must evolve and should be ready for the post about the age of 40, having been some years in active surgical practice. He would be eligible for re-election after five years, and again after ten years, and would retire at 65 or sooner. The work of the professor would be exacting and arduous, and anyone who made it a success would sacrifice a great position and fortune that might have been his if the same energies had been devoted to his private ends. In order to leave the professor entirely untrammelled by the need of practice and unfettered by success—the hardest of taskmasters—he must be adequately remunerated and should never have to repeat that brave Hunterian saying about the "damned guinea," and indeed I would like to think of him as in the fortunate position of the American surgeon who, to the request of the millionaire that he should "Come at once: money no object," was able to reply, "Cannot come: money no object." He must also be assured of a retiring pension, and of a good vacation each year, part of which he might be expected to spend in visiting other clinics at home or abroad, or in attending congresses, etc. He would be in entire charge of the teaching clinic, and, depending on the size of the school, would control from 100 to 200 beds. The clinic would require an operating theatre with its necessary appurtenances, and in close proximity a demonstration theatre capable of seating 200 to 250 pupils. This theatre must be fitted with every possible contrivance for demonstration purposes—epidiascope, cinematograph, lantern, blackboards, screen for diagrams, illuminating box for X-ray plates, etc., etc., and it must be possible to darken and lighten it in a few moments. But let it be clearly understood that these contrivances are merely to supplement the demonstrations on the living patient and never to take the place of actual clinical material. In the vicinity would be the laboratories, hand museum of type specimens, X-ray room, dark room for cystoscopy, etc., room for operations on the cadaver, library, and the professor's private room.

To carry out the work of the clinic the professor would require an adequate staff, probably two senior assistants who would rank as assistant surgeons, two junior assistants of the standing of surgical registrars in English hospitals, and two or more house surgeons and the proper proportion of clerks and dressers, depending on the number of beds.

The assistants should be allowed to engage in surgical practice, but they ought also to be paid, not lavishly but just enough to enable them to accept the appointments and to encourage them to work for the higher posts. British hospitals are greatly hampered by the paucity of junior assistants, and there ought to be numbers of posts each with a sufficient honorarium to enable men to wait and to work for preferment, while at the same time they may enter the ranks and engage in the competition for work "outside." This would greatly enlarge the training reserve of those who essay to become specialists in surgery and to be the lecturers and professors of the future. The increase of the numbers in training would tend to seek out those best suited for the teaching posts, while many would fall into other lines and would find before it was too late that they were better suited for some other branch of professional activity. The material for the clinic would be provided by a regular intake according to the scheme adopted in the particular hospital, and also from cases sent specially for the opinion of the professor.

The professor would give a short introductory course of systematic lectures on the Principles of Surgery but these would be illustrated by cases from the wards whenever possible. From time to time the work seen in the clinic would be supplemented and co-ordinated by an occasional systematic lecture, but the greater part of the teaching would be clinical, and would be conducted after the Kocher plan. The professor would himself perform demonstration operations and would also deal with the more difficult cases. His assistants would be largely responsible for the routine operating and would work up the material for the clinical demonstrations so that the professor might be free for the more important cases and for his duties as director of the clinic. The assistants would also carry on the work in the absence of the professor, for in every way they would act as a "team." Time will not permit me to enter into all the details of the work associated with such a clinic as I have outlined. Nowadays the investigation of cases prior to operation is often complicated and exacting, and this work would be superintended by the assistants and would probably be subdivided amongst them. But everything would be available for teaching either in the main clinic demonstrations conducted by the professor, or in the smaller tutorial classes which I have mentioned. It would also be necessary to conduct special courses for those who wished to proceed to higher degrees after graduation.

But the appointments as clerks and dressers to the surgeons who are not connected with the main teaching unit must be looked upon as a most essential part of the students' education. Not all who hold hospital appointments are born teachers, but all can teach in their own way, and we want as many clinical teachers as possible in order to make the fullest use of the available material. The surgeons, relieved of their big classes, would have much more time to attend to the education of their clerks and dressers, and must look upon this part of their duties as of the first importance. In order to make the most of the Hospital Unit in the University the teaching must be more spread out. The morning might be reserved for the work of the main teaching clinics and the afternoons for the ward visits of the other surgeons and for their operations. The teaching in the main clinics would only be in term, but the classes for the clerks and dressers in the wards would go on the year round and without hardship, for the staff of each set of surgical wards would form a "teaching team" so that when the senior is absent on vacation the junior who takes duty for him would automatically carry on the teaching. It would indeed be a brain-cracking task to fit in the claims of the various teaching departments with one another, but there can be no insurmountable difficulties, and in a short time after the change evolution would come to our aid.

If the whole-time professor is accepted in principle, there are other ways in which the work might be arranged to the advantage of the classes. The plan I have outlined is purely tentative, but it would, I am convinced, be workable and efficient. Of course it would be much easier to introduce such a plan into an entirely new school, but even long adherence to old-established practices, to say nothing of vested interests, could be broken down by goodwill and co-operation if it were once conceded that such a radical change is essential.

But if we relieve a man from so much of the turmoil of life we must expect his very best, and though the whole-time professor would be primarily a teacher he must be a worker in the surgical world and endeavour to keep his school in the forefront of progressive surgery, while at the same time he must cultivate the spirit of research among his pupils.

It is unfortunate that the general conception of research should nearly always be connected with special laboratories, expensive apparatus, numerous assistants, and animal experiments, and should foster the notion that nothing worthy of the name can be done without such aids.

Personally I have the highest regard, amounting almost to veneration, for the work that pours in unceasing streams from our laboratories, but I do plead for the recognition of the other sort of research which is purely clinical and macroscopic, and of which the laboratory is but as the handmaiden. The war has furnished admirable examples of what I mean, for I contend that all the best work on wound treatment, on nerve suture, or bone grafting has been purely clinical. There could be no question of limiting the professor in his activities or outlook, but it would be of great advantage to the students if they saw in his work that most useful research can be done from the purely clinical standpoint, for most men go into practice with the idea that research is only for superior persons with well-equipped laboratories, and that their prospects of adding to the sum-total of knowledge is non-existent.

This discussion is entitled "The Education of the Medical Student," but I would like to say a word on Post-Graduate Teaching, because medical men ought always to be students, and because this part of our work has been so largely neglected in Britain. I would make it a rule that practitioners were free to attend any of the demonstrations in the teaching clinic, and I also think that the professor, largely relieved of the calls of practice, should be expected to give one or more demonstrations or lectures each session especially for practitioners. Similarly the other surgeons, relieved of much routine teaching, might devote some of their time to similar work, either in small classes or as set lectures and demonstrations.

In concluding I would submit—(1st) That the teaching of such an important subject as Surgery is enough to occupy the whole of a man's time. (2nd) That Teaching Clinics must be adequately equipped both as regards accommodation, apparatus, and assistants. (3rd) That those who are prepared to devote the whole of their training and time to the work of teaching must be adequately remunerated.

These are the days of great and unexampled changes, and it may be that if those responsible can only make up their minds exactly what is wanted to put the teaching of surgery on a better footing it may be brought about at one time and in its entirety.

XXVII.—REMARKS ON THE TEACHING OF CLINICAL SURGERY.

By F. M. CAIRD, Regius Professor of Clinical Surgery, University of Edinburgh.

It may be granted that the prime object of a general medical education is to form a trustworthy practitioner who possesses a healthy self-confidence, derived not so much from what he has learned in books but from what he has seen with his own eyes, touched with his own hands, and recognised for himself. Conscious of his own limitations, he remains always a student; thoroughly imbued with the axioms of Hippocrates, he is ever anxious to progress and has the welfare of those under his charge as his first aim in life.

Clinical surgery forms an ideal field for such a training. Habits of observation are speedily attained, and by careful and continuous practice the student almost reflexly learns to note contours, colours, actions, and peculiarities at a glance from the first moment he sees a patient. The hands readily acquire the necessary dexterity and gentleness of touch in conducting an examination, and every case seen should leave a lifelong impression. Men become more keen and appreciative in proportion to the individual opportunities they receive, and the more they are encouraged to observe for themselves the greater becomes the value of their effort. They learn to apply the knowledge they have gained and build for themselves on the solid foundations of anatomy, physiology, and pathology.

It is of the utmost importance that the student should study the natural history of a disease from its start to finish. He should graduate with a clear conception of what can be accomplished by surgery, how far it can cure and alleviate ailments or fall short of success. It is not enough to recognise disease and follow the treatment, to note the progress or complications which may ensue till the patient leaves hospital—the end result should be seen, and for this purpose cases should be presented months after operations and similar cases years after they have been dismissed.

A young graduate who has handled many cases of carcinoma, say of the mamma or alimentary canal, who has witnessed operative procedures to combat these conditions, who has noted failures and recurrences, but who has also seen a large number of such cases in excellent health years after operation, who, in like manner, has been impressed by the successful treatment of tuberculosis of bones, joints, and peritoneum, will carry away with him a more vivid and a saner view of his responsibilities to those under his charge than does the superficial observer, who, neglectful of his clinical work, is prone to drift into a pessimistic nihilism or become lost in the latest fads of fashionable nostrums. Considering the limited time apportioned to clinical surgery in the present curriculum every hour is precious, and no day should pass without hospital attendance. It is fortunate that clinical surgery can be well taught to comparatively large classes. The patient occupies the centre of a roomy area, where he has space to move and may be inspected from all sides. Students examine in rotation; by question and answer their impressions are estimated and mutually compared. The surgeon sums up, a provisional diagnosis is made, the requisite line of treatment indicated, and at a future date the case is again presented and considered. Cases which do not lend themselves suitably to such a method of demonstration are inspected by smaller groups of students. Once a week, for two hours on end, such a polyclinic takes place. In this fashion an out-patient clinic is constituted in which interest is maintained. All manipulation takes place under supervision—the gentle touch is acquired, and students are taught to couch their remarks in language which convey little to the patient, and to elicit points of family history and habit which have direct bearing on the case with due regard to the feelings of the individuals concerned. The special end in view is to note what is important, to elucidate facts which bear on the points at issue, to weigh evidence, to deduce, to form a fair diagnosis as well as a prognosis, in a concise and logical manner. Ethical questions crop up and opportunities arise of indicating the special obligations of the practitioner to his patient and to others.

Special clinical lectures are delivered twice a week. Here one case may form a text, or the wards may afford material for a series of cases or subjects occupying thirty minutes or more at each meeting. The remainder of the hour is devoted to approaching operations, in which anatomical and physiological principles of general application are emphasised. At the conclusion of every lecture other patients are seen or a ward visit to note progress of some special case is made, but no day passes without the student employing his hands. Operations occupy three days of the week. It is essential that the student should be familiar with all the more usual operations, and care is taken that he sees all the emergency cases as far as can be arranged. Clinical clerks have the privilege of being in the area of the theatre and benefit by close inspection, while they do not impede the view of others. Prolonged operations are relegated to Saturday. The Sunday quiet affords time for instruction in the sigmoidoscope, cystoscope, separator, plaster-of-Paris work, and a general ward review. Various methods of inducing anæsthesia—general, local, and spinal—are constantly employed.

It is important, in the event of a sectio, that the surgeon should be present with his class. Then or previously a *résumé* of the case is given with the anticipated findings. There can be no doubt that the services of an assistant pathologist who has special surgical training or bias is a great asset on such occasions.

The method of instruction, then, is that so long familiar to the Edinburgh school. It is identical with what is pursued in all the great teaching centres of mid-Europe. It enables a larger number of men to see, touch, and hear than is afforded when a crowd of students pass from bed to bed hearing little, seeing less, and rarely using their hands. It is a method which brings the teacher and student into close association. It breaks down shyness; men are not afraid to air their own views or to be in error. They are stimulated to take an active interest in their work and rapidly evince a personal sympathy with the patients under their observation.

Such a scheme of training demands the presence of the surgeon for at least three hours daily in hospital. With advantage he might devote all his time to teaching and research, and in Edinburgh teaching should come first. As a whole-time teacher he would require a suitable salary. He should have the services of an assistant surgeon who might act in his place as occasion demanded, and who should take part in the conduct of the course. A surgical tutor is necessary to supervise the museum, pathological work, X-rays, and case reports. The tutorial instruction of the surgical departments should not overlap, nor should it take the place of honest clinical work on the part of the student. The resident should have in view a career as surgeon or gynecologist and act for twelve months.

The student of to-day is overburdened. It is questionable if the existing conditions whereby every obstacle is presented to delay his hospital attendance till he has passed anatomy and physiology is really beneficial. The postponement of his life-work—his clinical training—gives rise to crude, undigested preparation. It does not yet appear certain that the new curriculum which takes him to the medical house before he enters the surgical hospital is going to prove a success or that it lightens his burden.

Certain it is that even before the present great war the general mass of the students already appeared to be lacking in that appreciative interest and enthusiasm with which they formerly approached ward work. It may, however, be that our medical colleagues find them more responsive and fresher than of yore. At present there is a tendency to shirk the duties of clinical clerk. No longer are the wards visited at night. It is said that such evening visits are unwelcome to resident and ward sister, who regard the student as an officious intruder. This may well be so, for as long as the authorities choose to tolerate a pernicious system by which a student may change his teacher and his wards every three months, the resident and sisters fight shy of committing responsibilities to a bird of passage of whose capacity they know nothing. Clinical training under such conditions is unworthy of the name and is a disgrace to the school which permits its existence. At least six months' training in one set of wards should be compulsory upon all. Class examinations for honours should be voluntary, and at the professional examination at least one examiner —a well-known teacher, selected from another school—should always officiate.

How to relieve the congested curriculum without undue prolongation, and how to give the student more time for study, remains a question. Some alleviation might be obtained by shortening the summer vacation, and were July and August set apart as holiday months, September would be available for special subjects, anatomy, and clinical work.

XXVIII.—SYSTEMATIC SURGERY, *I.E.* THAT OUTSIDE THE HOSPITAL AND AWAY FROM PATIENTS.

By Professor ALEXIS THOMSON.

I AM not satisfied with the present system of teaching surgery, and have often expressed my doubts regarding its efficiency both to my assistants and to my students, without having been able to obtain from either of these sources anything definite in the shape of reform. I should feel on much more solid ground were I asked to advise as to the training and education of the surgeon.

To judge from my own experience as a student, teachers of surgery are the last persons who should be consulted as to the method of teaching the subject: my own teacher, John Duncan, whom many of us regarded as the best surgeon in his day and generation, devoted an entire week of lectures to the subject of aneurysm, of which the practitioner might never meet with a case in a long and busy life. Duncan was not peculiar in this respect: some of his surgical contemporaries showed an even greater want of a sense of proportion, as witness the interesting personality, the late Professor Bennett of Dublin, who lectured for a few weeks on inflammation, tumours, and similar surgical chestnuts, and then devoted almost the entire session to fractures, which not even their frequency among the combative inhabitants of Dublin could in any way excuse!

The Period in the Curriculum at which Surgery should be Taken.—There are two attitudes on this question, varying widely from one another; there is (1) the traditional or classical view that surgery, being one of the fundamental subjects in the curriculum, should be taken as early as possible, so that the student, having the "Principles of Surgery" instilled into him, may be enabled to obtain a better grasp of the subjects that are to follow; and there is (2) the opposing view which claims no such fundamental importance for surgery; which does not think a course of instruction in surgery helps the student to obtain a better grasp of other subjects, such as pathology, midwifery, or medicine; which does not understand what is meant by the "Principles of Surgery," but which, regarding surgery as a special branch of diagnosis and therapeutics, would have it taken after the other subjects in the curriculum, in this respect resembling children's diseases, gynecology, and other specialties.

My predecessor, whose views have always claimed my attention and nearly always earned my respect, did not at all approve when he was told that medicine and surgery had changed places; he did not think the student could have surgery too early in the curriculum, nor could he ever turn out well without being thoroughly grounded in the "Principles of Surgery." While I am with those who advocate that surgery should be taken late, *i.e.* in the fourth year, I would strongly support *any method that would give an insight into clinical work at an early stage* so as to prove or demonstrate the *necessity of knowing* the fundamental subjects on which surgery is based. For example, a method that prevails in certain American schools: in the first six months of anatomy the students are taken over to an operation for strangulated femoral hernia; it is there pointed out how essential it is that the operator knows the anatomy of the region, and they go back to their anatomy with fresh interest, encouraged to master its details. Similarly, the class of physiology is taken to the hospital and shown a case of locomotor ataxia, and how the conducting paths of the cord are interfered with by this disease, and how important it is, therefore, to know the functions of the nervous system and of the other organs in the body; the students will return to their physiology similarly stimulated and encouraged.

This idea is a good one and might be extended. We do not wish the anatomist to teach operative surgery, nor the physiologist clinical medicine, but both these teachers should never lose sight of the practical bearings of their respective subjects and that their students are to be medical practitioners.

We now pass from the *time* at which surgery should be taken to the *amount of surgery and surgical anatomy* the student should be expected to master. To take a concrete instance—Is the general practitioner to open an axillary abscess? The answer will be surely, "Yes." Then he ought to remember where the axillary vessels are! Can he be trusted to remember this from his anatomy course? No; he must have a revisal in his fourth and in his fifth years. What about the *operative class?* My view is that it is too expensive a revisal both as to time and energy of the student and of the surgical teacher and his assistants, who might be better employed. The operative class takes more out of the teacher of surgery than any other line of work that falls to his lot. I may add that some schools dispense with it, and I cannot discover that the students suffer from its absence. Probably a short course of surgical anatomy such as that given by our own lecturer on the subject might replace the operative class, but I would advise there should be one both in the fourth and in the fifth year, and a question on it should be set in the final written examination.

Surgery.—Are we to legislate here for the many who practise in, or in the vicinity of, large towns where there are surgeons, or for the minority who are to practise in the Highlands and Islands and the Colonies, where, on the occurrence of an emergency, the onus lies on them to see the patient through? In a cosmopolitan school like Edinburgh, our graduates settling in all parts of the Empire, the surgical standard should at least include the *operative treatment of emergencies, e.g.* strangulated hernia, acute appendicitis, perforation of stomach or duodenal ulcer, tracheotomy for threatened suffocation, retention of urine, amputations. Apart from such emergencies in districts where no other help is available, it may be said that surgery has now arrived at a position beyond the reach and power of the family doctor; he should not, in the interest of the patient and himself, perform surgical operations.

In addition to emergencies, the general practitioner should be thoroughly informed on the following: treatment of fractures and dislocations, arrest of hæmorrhage, diagnosis of cancer, malignant disease, hæmorrhoids. He should have a smattering of other subjects, such as intracranial surgery, operations on the stomach, etc.—merely a smattering to enable him to discuss the subject. Far more important than the accumulation of facts concerning injuries and diseases is the *training of the student's powers of observation;* there is nothing better, for example, in the out-patient room than to give each student a patient and require him to give a diagnosis, which he must substantiate by stating the history and symptoms, and showing the signs to the teacher and the whole class. The difficulty of carrying out this method in the Edinburgh school lies in the number of students.

In any case the teacher can only show the way: the student must travel along it himself. It is an advantage that the way should not be too easy; overcoming difficulties impresses the mind and memory.

My object, since my appointment to the chair, has been, apart from the differentiation of subjects into those essential for the practitioner and those of which only a smattering should be expected, to increase the material of the department, with the object of appealing to the eye, as much as, or even more than, to the ear. I was the first to introduce the *epidiascope* into general use, and to institute the *cinematograph,* unrivalled for showing the reduction of dislocations, setting of fractures, and a good many other procedures that might not occur during the period the student was attending at the Infirmary, such as *Cæsarean section*, of which all the dramatic features are reproduced, and the film can be repeated until the important points have been mastered. The war has interrupted this development—it was my hope to exchange films with teachers in other centres—Grey Turner in Newcastle and others—and so acquire in time a tolerably complete set, but my cinema is now on board H.M.S. *Lion*, and my friend, Grey Turner, was until recently in Mesopotamia. I have gone in very largely for photographs, lantern slides, and other forms of pictorial display. I hold that when lecturing, say on *rodent cancer*, if I can show slides of twenty-five or thirty cases—the accumulation of years—it ought to impress the student with the chief features of that disease.

XXIX.—ON THE TEACHING OF SURGERY.

By ALEXANDER MILES, Surgeon, Royal Infirmary.

THE question has frequently been asked in the course of this inquiry—"What is our object as teachers in a great medical school?" The answer has come that our aim is twofold—(1) to turn out efficient medical practitioners, and (2) to initiate the training of those who propose to specialise in practice or to pursue scientific research.

I accept this answer as the basis of what I have to say to-night.

Now, hitherto we have attempted with the same machine to turn out these two different products at one and the same time, and neither of them has been altogether satisfactory. The fact is, a machine can only turn out one complete product at a time; to employ it for a second purpose it must be capable of adjustment.

Further, our completed product must by law be stamped with a degree and we have only one stamp available for the two products—the degree of M.B., Ch.B. (I leave out of account at present the Doctorate of Medicine, because while the university examines for this degree it makes no special provision for training candidates for it).

If we are to continue to train our students towards these two different ends, we must adapt our teaching machinery for the double purpose, and we must make some distinction in marking the results. There are different ways in which this might be done: for purposes of discussion I select one and put it forward as a concrete proposal, viz. that the university should confer two bachelors degrees in medicine—(1) a simple pass degree (M.B., Ch.B.) and (2) a higher degree for which the candidate, who must hold the pass degree, would select a subject or group of subjects recognised by the university for special study, and obtain the degree M.B., Ch.B. *with honours* in the subject selected.

I. TEACHING FOR THE PASS DEGREE.

As regards the adjustment of our machinery, I shall first refer to the teaching of the candidates for the pass degree, as this would necessarily apply in the first instance to all students.

And here, to save time, let me state, without arguing, some general propositions for the consideration of the Club.

1. *That all students should begin their studies in the winter session.*

This would obviate that confusion in the curriculum which results from some commencing in winter and others in summer, and would facilitate any wider co-ordination of teaching or rearrangement of the curriculum that may be contemplated.

2. *That every student should enter the hospital in his first term.* This would at once enlist his interest in the clinical aspects of his study.

The surgical out-patient department would be the best introduction, and a few elementary cliniques should be arranged, specially designed to meet the requirements of freshmen. It would obviously not be the business of the teacher at these cliniques to attempt to teach surgery, but rather to draw attention to salient facts which indicate the presence of disease and to cultivate in the student the faculty of observation. He would also find, or make, opportunities of pointing out how the introductory scientific subjects bear upon clinical work—anatomy in relation to diagnosis; pathology in explaining symptoms and signs; chemistry in relation to antiseptic agencies, and so on. Attendance should only be required at most twice a week, and as Saturday could be one of the days, this would interfere very little with the student's other studies. In his first term he would thus have twenty opportunities of visiting the hospital, and, if he saw on an average three new subjects illustrated at each visit, he would have sixty object-lessons on the bearing of his preliminary studies on clinical problems of diagnosis and treatment. This, I submit, would do more to enlighten him as to the importance of the non-clinical subjects in his curriculum than the *ex-cathedra* lectures that have been suggested for this purpose. To the junior student I can well believe that these would be the most interesting hours in the week and he would not often miss them.

3. *That during no term throughout his course should he be entirely excluded from the hospital.* In succeeding terms, demonstrations conducted on similar lines might be arranged in the medical out-patient department, in the out-patient departments at the Sick Children's Hospital, in the X-ray department and later in the Lock department.

There may be difficulties in providing such a clinique in each of the terms before the student actually reaches his clinical classes, but with a readjusted and co-ordinated curriculum, such as we hope to evolve, some such arrangement should be possible.

It cannot be right that a man who is learning to be a doctor should be debarred by regulation from coming into contact with sick people during two-fifths of the period of his training.

Teaching of Surgery.—Now, I come to refer more particularly to the teaching of surgery.

I take it, the aim of the surgical teacher should be to equip the student with a sufficient knowledge of surgery to enable him when he enters practice (1) to diagnose any ordinary surgical condition he is likely to meet with, and more particularly all acute affections calling for prompt treatment; (2) to treat such conditions as do not call for specialised operative treatment; and (3) to recognise what is necessary for cases that are beyond his own powers and to know what can be done for them. We cannot hope to make him familiar with all the possibilities in surgery, or to render him capable of undertaking difficult operative work.

This means that we must define the scope of our teaching, and this necessitates the formation of a *Surgical Board of Studies* to draw up a *syllabus* which would be approved by the Faculty. For the proper co-ordination of the teaching a *Surgical Board of Studies* should include, in addition to the teachers of surgery, an anatomist, a pathologist, and a physiologist, and I would suggest that when formed it should co-opt two carefully selected general practitioners—one in a good class city practice, and one from a mining or industrial centre—who could from experience indicate the surgical requirements of a young graduate.

While the syllabus drawn up by the Board of Studies would delineate the scope of the surgical teaching—systematic and clinical—it must do no more, and individual teachers must be left free to illustrate their class lectures or ward instruction from subjects outwith it at their discretion. The class and professional examinations, however, should be confined to subjects embraced in the syllabus. It is obvious that a similar Board of Studies would be necessary for each division of the curriculum.

Systematic Surgery.—If I refer to the systematic teaching of surgery, in which I am no longer engaged, it is because I feel strongly the desirability of a closer co-operation between the systematic and the clinical teachers. From my experience as an extra-mural lecturer on the subject, extending over a good many years, and after a brief return to the subject recently, I am convinced that the traditional course of 100 lectures could with benefit be materially curtailed. There is no lack of reliable surgical text-books, and if the subject is limited by the syllabus I suggest, I believe that fifty lectures would suffice.

It might be possible for the clinical teachers to deal with certain groups of common conditions, *e.g.* diseases of joints, surgical affections of the stomach, urinary diseases, etc., in a definite order in the term, after which the professor of surgery would deal with each subject in a few lectures, systematising the knowledge which the student has gained clinically. If these could synchronise with the teaching of the same subjects in medicine and pathology the student would obtain a more connected view of each than obtains under the existing plan. The fifty hours saved would be more profitably spent on practical work, and the professor, or extra-mural lecturer, would be free to devote more time to the individual teaching of the students in practical classes than is possible at present.

It would be a further advantage if the course were divided into a junior course on general surgery and a senior course (given later in the curriculum) on regional surgery.

With regard to the class of *Surgical Pathology*, which is an integral part of the surgical department, I would suggest that the lecturer on this subject should be *ex officio* a member of the pathological staff of the Infirmary. He might conduct the surgical post-mortems, and (under the head of the department) give demonstrations on the specimens thus obtained, as well as on specimens obtained at operations throughout the hospital. He might also supervise the clinical clerks in preparing specimens, sections, and cultures, and in drawing up their reports on these for the surgeon's records.

Co-ordination would thus be effected between the Professors of Surgery, Pathology, and Bacteriology, the Lecturer on Surgical Pathology, and the Lecturers on Clinical Surgery. The Conservator of the Museum of the Royal College of Surgeons might, by arrangement, be included in the general scheme, and the fine collection under his care be more widely utilised for teaching and for private study.

Operative Surgery.—With regard to this class I confess that I have never been convinced of the educative value to the undergraduate of operations performed on a mummified cadaver. As it has hitherto been conducted, it is a waste of material and of time, and gives a false impression of values. Its main use is as a means of teaching surgical anatomy, but this, I feel sure, would be better effected by the students making a deliberate dissection of the part through an operation incision than by pretending to perform the operation. Prepared dissections, transverse sections of limbs, etc., demonstrated to small sections of the class seated round a table would be of great value. Did time permit, I could suggest various means by which the student could obtain in this class a considerable amount of manipulative practice which would be useful. In this class there is a fruitful field for the co-operation of the Professor of Anatomy and of Surgery and of the Lecturer on Surgical Applied Anatomy.

Applied Anatomy.—It is in connection with the class of operative surgery that the co-operation of the Lecturer on Applied Anatomy would be most useful. At present in our school the student is recommended to attend the class of applied anatomy in the first winter term of the fifth year; that is, he is to study applied anatomy *after* the subjects to which it is applied. Would it not be possible to correlate this very important class with (1) clinical medicine; (2) clinical surgery and particularly the operative class; and (3) the special subjects—and so keep up the continuity of anatomical study throughout the whole course?

Clinical Surgery.—If a general scheme of teaching surgery were represented diagrammatically as a wheel, clinical surgery would form the hub, and all the ancillary subjects—anatomy, physiology, pathology, and the rest—would be the spokes converging on it. On the hub lies the patient: let us see to it that the student is always beside him, so that he may come to regard every other subject from the point of view of how it affects the patient. That is why I want the student to enter the hospital at the very commencement of his course and to be continuously in touch with it. Clinical knowledge is absorbed rather than instilled, and to acquire it needs time and abundant opportunity. The teaching is necessarily desultory and cannot be condensed or definitely systematised, and one of the main functions of the clinical teacher is to afford the student favourable opportunities and conditions for teaching himself.

How this is done in each clinique must be left to the discretion of the individual teacher. His method is the natural expression of his individuality as a teacher.

There are, however, certain conditions that must be attained if the teaching of clinical surgery is to be efficient—

1. The hospital hours must not be encroached upon by the teachers of non-clinical subjects.

2. The teaching of clinical surgery must no longer be made secondary and subsidiary to the teaching of the *special* clinical subjects. Nothing has done more to interfere with our teaching than the arrangement by which the students attend special classes on the same days as they attend clinical surgery, and during the first hospital hour.

3. The students' attendance at hospital must be rigorously enforced, a roll being taken daily and a high percentage of attendances made necessary for a certificate. It must not be accepted as a valid excuse for absence that the student was preparing for a class examination in some other subject.

4. Greater use should be made of the out-patient departments for the teaching both of junior and senior students. The officer in charge must be given a better status and more assistance in teaching. The practice of the full surgeons giving out-patient cliniques for senior students might be reverted to with advantage. For the future practitioner the examination of fresh cases as they arrive at hospital is of great educative value, and his wider experience renders the senior surgeon the most appropriate teacher.

5. The statutory clinical lectures, given twice a week, should be abolished, and the teacher in each clinique be left free to utilise the time at his disposal to the best advantage of his class. He may deliver at his discretion a set lecture on occasion, if he has material suitable for this form of exposition.

6. The assistant surgeon attached to each charge should take a large share in clinical teaching: the teaching of junior and senior students separately will necessitate this.

7. Tutorial instruction in practical details, particularly of minor surgery, such as a practitioner will undertake in his practice, should receive more attention. The staff of the out-patient department might co-operate with the systematic and the clinical tutors in arranging this work. A special syllabus should be drawn up for the guidance of the tutors.

8. I confess to a certain amount of doubt as to whether the student does not spend a disproportionate amount of time in merely witnessing operations. Certain operations he should see many times, others at least once; but there are a good many frequently performed from which he learns nothing. It is true that he often takes the matter into his own hands and absents himself, but his time is thus wasted, unless provision is made for him doing other work in the hospital.

9. Lastly, each of the teachers—out-patient officer, tutor, assistant surgeon, and surgeon—should keep a record of the individual student's work, and assess it in marks, which would be recorded and taken into account at his professional examination. If the student knew that the records of his class-work would be carried forward to his professional examination, it would ensure his concentrating his attention on the subjects throughout and do away with the cramming before examinations which is so prevalent. Such a method would, in addition, furnish a better criterion of a man's fitness for practice than the present final examination does. The principle has already been accepted with regard to the special subjects.

The whole question of examinations, however, will require to be taken up by the Club at a later stage of our inquiry, as the recasting of the curriculum on the lines that have throughout been suggested will involve a revolution in our methods of testing the student's knowledge.

A CO-ORDINATING SCHEME.—In the discussions that have preceded, the desire has been generally expressed that the teaching of the preliminary scientific subjects should be continued further into the curriculum so as to bring them into closer relationship with the clinical subjects. This seems to carry with it the possibility of commencing clinical study a little earlier, and so distributing hospital work over a longer period.

It has also been suggested that the systematic courses in certain of the later subjects might be broken up into junior and senior courses.

To focus these ideas in concrete form, it might be suggested that clinical study proper begin in the summer term of the second year, which could be devoted to the Course of Instruction in Clinical Methods—physical signs, urine testing, etc.—developed at last meeting by Professor Russell. Coincidently, the anatomy of the thoracic, abdominal, and urinary organs would be dealt with by the Professor of Anatomy; the physiology of these organs by the Professor of Physiology ; and their morbid anatomy by the Professor of Pathology.

The junior student would thus obtain a sound foundation for the junior course in medicine, which could be given in the first term of the winter session of the third year, during which term he would also be at work in the medical wards, the cliniques there being systematised in the manner suggested by Dr. Matthew.

In the second term of the third year the junior course of surgery (on general surgery) could be given, coincidently with instruction on such portions of anatomy and physiology as might be arranged, and with demonstrations on general surgical pathology. This would prepare the student for entering the surgical hospital in the summer term of the third year.

The senior courses on medicine and on regional surgery could be given later on, preferably towards the end of the student's clinical work, so that the professors could systematise and bring into perspective what has been learned in the hospital—the senior surgical course, say in the first term, and the senior medicine course in the second term of the fifth year. (This inversion of the order is necessary to keep junior and senior courses in different terms.)

The remaining terms of clinical medicine and clinical surgery could easily be adjusted, as well as the periods of attendance at gynecology, fevers, mental diseases, dispensary, etc. It would be an advantage if the surgery of children could be studied at or about the same time as the surgery of adults, and so with medicine. There remain the other special subjects, with which I shall not deal further than to say that they must be arranged so that they do not clash with the general clinical work.

II. TEACHING FOR THE HONOURS DEGREE.

Although this subject does not pertain strictly to the present discussion, I must refer to it briefly, as it bears upon my argument.

The subjects in which a candidate might take the Honours degree would require to be very carefully selected by the Medical Faculty. Those subjects in which the university grants the degree of Bachelor of Science, *e.g.* in pure science (which includes chemistry, zoology, and botany) and in public health, would probably be excluded. It is doubtful if the diploma in tropical medicine and hygiene and the diploma in psychiatry stand on the same footing.

It would probably not be necessary to draw up any syllabus for this degree as the candidate would be expected to be familiar with his subject in its widest aspects. As all the candidates for Honours degrees would already be graduates, the Honours course would naturally form the standing machinery of a *post-graduate school.* It would be a simple matter to arrange for graduates from other schools, and practitioners who desire further study, to take part in it without, of course, becoming candidates for the Honours degree. In the Post-Graduate Course, so successfully carried on for some years before the war, we have a basis on which such an Honours school might be built up. It would be a great advantage to have post-graduate teaching going on in term as well as (or instead of) during vacation only. Under such a scheme it seems possible to add materially to the teaching power of the university.

It is generally conceded that the best way to learn more of a subject of which one knows a little is to try to teach it to someone who knows less. Could not the members of the Honours school be employed as *junior demonstrators* to students in the practical classes of such subjects as anatomy, pathology, physiology, surgery, etc., or as clinical assistants or tutors in such classes as clinical medicine, clinical surgery, as well as in the eye, ear, and skin departments, and at the Sick Children's Hospital? If such arrangements were possible they would carry with them various advantages, *e.g.*—

(1) Practical instruction could be given to small sections of a class, and the students would therefore receive more individual attention. (2) The Honours students would be afforded a practical means of improving their knowledge and find a healthy stimulus to work. (3) The teaching faculty would be developed in those who aspire to a teaching career (or its absence might be revealed). (4) The professors and senior teachers would have a means of estimating a man's capacity in this direction before selecting him as an assistant or tutor. (5) There would be a wider choice of assistants, etc., than at present, and they would be more highly trained. (6) Members of the Honours school would be able during the vacations to devote some time to research work of an elementary or preparatory kind. (7) And lastly, as these junior teachers would (presumably) be unpaid, the university teaching staff would be augmented without drawing on the university chest.

Against this last advantage must be put the cost of such increase in the senior teaching staff as would be necessary for instruction of the Honours candidates, but as these candidates would pay fees for their classes this would probably not be great.

Lectureships already exist in the university in such advanced subjects as experimental pharmacology, neurology, physical methods in the treatment of diseases, medical entomology, as well as in other specialised subjects, such as mental diseases, dermatology, ophthalmology, laryngology and many others. I should suppose that the lecturers in these various departments would welcome a body of students specially interested in their subjects and intending to devote themselves to them. Under a two-standard system of teaching these classes would be largely composed of Honours men and other post-graduate students, and the standard of the teaching would be adjusted to their needs. It cannot be doubted that the teacher would be stimulated by such an audience.

It is probable that the house physicians and house surgeons in the Infirmary, the Sick Children's Hospital, and other hospitals, the clinical assistants in the special departments, and the *paid* demonstrators in anatomy, pathology, etc., would be selected from among those who have taken the Honours degrees in the respective subjects, or from candidates for Honours. This would ensure a high standard of efficiency in these officers and great keenness for their work.

I may add that in so far as these tentative proposals are constructive I have attempted to work them out in some detail. But the time has not yet come for the Club to enter upon the discussion of details, and I leave them now as general propositions.

I should like to have the opinion of the Club on—(1) The general idea of a two-standard system of teaching, with its corollary of a post-graduate school. (2) The limitation of the scope of surgical teaching for ordinary graduates (whether an Honours degree is accepted or not) by means of a syllabus. (3) The means of co-ordinating the earlier scientific subjects with surgery. (4) The *rôle* of lecturing in the scheme of teaching surgery. (5) The possibility of devising a means by which the student's class record could be made an integral factor in deciding his professional examination. (6) A practical means of co-ordinating the teaching of the scientific with the other clinical subjects.

DISCUSSION.

Mr. J. M. Cotterill.—If a sixth year is necessary for the Honours man that will be a difficulty. Otherwise many of us might consider Mr. Miles' Honours course an excellent thing. It is true that a small percentage of the students are subsequently called upon to do the more difficult and intricate operations, yet they are all supposed to be taught them. There might be some economy of effort in that direction. Might not the teacher of systematic surgery omit a good many of these more difficult operations, leaving them to the teacher of applied anatomy and the lecturer on operative surgery? It was my experience that the men's knowledge of the details of surgical ward work deteriorated very much during the last four or five years that I was connected with teaching in the Infirmary. There is no doubt that one reason for this was the encroachment on our time by other teachers. The acquisition of surgical capacity is very much a question of time and opportunity, and unless the students can spend plenty of time in the Infirmary, and are encouraged to come about it not only in the daytime but also at night, I am convinced that they will not know their work as they did in the years when it was the common practice to attend the Infirmary in the evenings. Nowadays they have neither time nor energy for the absorption of clinical knowledge in the hospital.

Professor Harvey Littlejohn.—Many of the suggestions made to-night are not only worthy of consideration but ought eventually to be adopted. Perhaps the Edinburgh school has been too conservative, and too prone to divide its curriculum into watertight compartments instead of allowing a certain amount of elasticity as regards spreading the tuition of various subjects throughout the course. In view of the advances that have taken place in medicine, it might be advantageous to split up important subjects, such as medicine and surgery, into two courses, one to be taken in the earlier part of the curriculum and the senior course at a later period.

I would remind Mr. Miles that a great many of the views he has expressed were put by the Faculty before the Clinical Surgery Board some years ago, *e.g.* that there should be the strictest record of attendance of students at the various cliniques, and that no student should get a certificate of attendance without satisfying the teacher as to his work and as to the interest he displayed in the class. By this means we would have a guarantee that when a student comes up for his clinical surgery examination he knows his work. Although the present arrangement is not ideal, I must say in vindication of the Faculty that we did submit the question to the teachers of surgery some years ago whether, under the circumstances and considering the subjects we had to put into the curriculum, they would agree to the special subjects of eye, skin, ear, nose and throat, and children's diseases being taken from 11 to 12 A.M. The surgeons agreed to that arrangement on the understanding that clinical surgery would be attended by the students from 12 to 2 P.M.

It would be better for all to begin study at the same time, but those who desire to do so must be allowed to commence in summer if they have qualified by passing the preliminary examination, provided always that they do not graduate at any earlier date than the students who begin in winter.

It is interesting that Mr. Miles should suggest some degree to stimulate the cultivation of post-graduate scientific work or advanced study; the Faculty has had that under consideration, and has agreed that there should be a degree conferred by the university not only upon its own graduates but on any graduate of a recognised university, this degree to be given for advanced study and research.

Mr. Dowden.—The teaching of the medical student should begin in his second three months with clinical surgery. His first three months I would devote to a brief *résumé* of bacteriology, anatomy and physiology. I would have him at the Infirmary, where he would be taught to observe and shown the effects of treatment. Afterwards he would continue in surgery throughout the whole of his course, including surgical pathology, bacteriology, anatomy, and physiology. He would learn the psychology of his patients by constantly being with them; he would become familiar with the appearance of wounds. I would do away with operative surgery on the cadaver, and also to a large extent with the operations which the student has to witness from a distance. The students should come in small groups to see an operation, and, if possible, they should assist at it. In the teaching of clinical surgery we lecture too much to the students without understanding the level of their knowledge. This, I find, can best be determined by question and answer. I agree that we should teach all emergency work. I would do away to a large extent with systematic lectures, except as an introduction to the subject, relying for that part of the work on small tutorial classes on the question and answer system. The student requires a small text-book containing the main principles. I am not in favour of an additional degree. We cannot expect the student, unless he has means, to stay up for a sixth year.

Mr. Wilkie.—We must follow certain broad lines in order to maintain the reputation of the Edinburgh Medical School. There is a unanimous opinion just now that the next few years will be a time of great opportunity for the school. The question of a whole-time professorship of surgery must be definitely faced in the not too distant future. Various arguments have been put forward against it, but if we are prepared to look sufficiently far afield, we will not have much difficulty in getting the right man.

I would appeal for a uniform system of case-taking in the Infirmary, under the supervision of a surgical registrar ; all cases to be collected together in a library and cross-indexed, to be the property of the university, and to be available to all the surgeons. Much time and labour in collecting case records would thus be saved. We should have in the Infirmary three resident clinical observers, who should be men who had been house-surgeons and had had some practice in research. Their presence would be a great stimulus, both to the teachers and to the students.

I would suggest that annual hospital reports, illustrated, should be published, including all the work done by members of the staff during the year. Great importance is now attached in America to graphic records of patients and of pathological material. Indeed, a school of medical art has been started in America, where artists are being trained for this particular work. Students would appreciate very much the inclusion of their work in the wards in this volume of annual reports.

I agree strongly with Mr. Miles in regard to the Honours degree ; it is to be deplored that all the graduates from this university rank at the same level. There is a tremendous difference between the really good graduate and the one who simply succeeds eventually in passing the examination. An Honours graduate of Edinburgh University should be considered to hold one of the best degrees obtainable anywhere.

Dr. Edwin Bramwell.—We who are teaching clinically all feel that the student neither spends the time at clinical work nor takes the interest in it that he should. Various remedies have been proposed, but I think the idea that the student's work during his course should be made to count in professional examinations is the most important of all, although it is difficult to see how this should best be arranged. In connection with medicine, I think the student learns more by case-taking than by any other method, and I would suggest that he should bring to his final examination records of the cases he has taken—approved by his various teachers—and that these records be accorded a proportion of the marks. If this were done, it would be a great inducement to students to spend more time in the hospital than at present.

I am in entire sympathy with Mr. Miles' suggestion of a more elaborate advanced course. My idea in connection with a post-graduate course has always been gradually to extend the comparatively simple teaching we give until it should receive recognition from the university.

Professor Gulland.—First and foremost, I would consider the splitting of the medicine and surgery courses. I am glad Mr. Miles has accepted that for surgery, because the time-table he has drawn up is admirable, and would make for efficiency in our teaching of pathological surgery and medicine. I am pleased that the teachers of surgery insist that they should not attempt to get into the heads of their students all the details, but that they should teach them to deal with emergency cases. My own feeling about surgery is that it should be in the hands of men who have shown that they can operate; a man should not be allowed to do major operations unless he has had special training in surgery.

As to the suggested Honours degree, the Post-Graduate School will be a burning question for us immediately after the war. We must have post-graduate instruction for the men who were hurried off to the Army or Navy as soon as they took their degree.

There is no doubt that Dr. Edwin Bramwell's suggestion of students bringing their marked cases up to the final examination will be adopted in the near future.

Dr. Dingwall Fordyce.—May I ask what principle underlay the institution of two separate chairs of medicine and surgery? If it is the fact that in the near future we must look to the Professor of Medicine as of necessity being a whole-time man, that will be a most important stand for us to take in Edinburgh. A good teacher of medicine is a rare person; but I think if we could attract a first-class man to Edinburgh he would be content to be a full-time man, if suitably remunerated, on condition that he had control of his subject—control of the subject of medicine, including, of course, systematic medicine and clinical medicine.

Mr. Beesly.—I am in agreement as to doing away with the class of operative surgery. I have always found that I could arouse much more interest in teaching surgery with anatomy.

Dr. H. G. Langwill.—Speaking as a practitioner, I would like to allude to the bearing of what one might call the practical part of surgery on practice. One of the most important subjects the general practitioner has to deal with from the surgical aspect is the treatment and management of fractures. The teaching in this respect is not as adequate as it might be. More might be done in the out-patient department and in the wards regarding the recognition of fractures and the management of the practical difficulties in their treatment. This work the practitioner has to face without the advantages of a surgeon in an institution. My experience is that when men come out as assistants and locums they are far too much in the habit of relying on the advantages they had as students: it is useless for them to rely, for example, on X-rays to diagnose a fracture.

Mr. G. L. Chiene.—We must recognise that we are trying to teach the student far too much, and the Board of Studies should form a syllabus from which he should be taught, and the surgical teaching should be limited in accordance with that syllabus. The man who wishes to become a specialist can afterwards study the more important surgical procedures.

Dr. Sinclair.—In connection with a possible Honours course of medicine, would it not be possible to remit the M.D. and M.S. of this university to an Honours course? If the higher degrees were made of more real and general importance, it might serve the purpose of getting a senior and junior degree into the school which would be of real value.

Mr. Jardine.—At present the teaching of the out-patient department is optional. It should be made the first preliminary of teaching in clinical surgery, and before he gets a certificate as a dresser the student should be required to have attended regularly for three months at the out-patient department.

It is difficult to carry out the teaching of fractures in the out-patient department, as only those of the upper limb can be taught. Lower limb fractures must be taken into the hospital. When the student has finished his dressership in the out-patient department he should be transferred to a ward as a dresser. He should be under a clerk and should be given the charge of a patient, who would nevertheless be directly under the charge of the clerk (a senior student). Each clerk should have under him three or four dressers responsible to him for the treatment of their patients. If such a student has had a good grounding in the out-patient department, he is quite capable of dressing wounds. Without this he loses all the personal interest in the patient that he ought to have. The great thing is that the student should feel personally responsible for the treatment of his patient, otherwise he will shirk his hospital work and read at home. As regards attendance at night, I think it is ridiculous that the students should be compelled to be out of the Infirmary by eleven o'clock unless they have permission from the surgeon in charge to remain later. Many of the emergencies in the out-patient department come in at odd times, and if the student is only there for a short time during the day he misses many opportunities. It should be possible to inform the students of what is going on in hospital. I am sure the men would come if they knew an interesting case was on hand.

Mr. Graham.—The men are not getting sufficient clinical instruction, and this is due to the fact that they are not compelled to attend; there is a certain laxity all round in seeing that they actually come to the clinique. Attendance should be taken at every clinique. In a voluntary class of surgical pathology which I introduced a few years ago I ascertained the name of each student each day, and I have never had more regular attendance in any class. The clinical teaching would be furthered if on one of the surgeon's operating days each week the assistant surgeon gave a clinique while the operations are going on. The value of systematic teaching will always be somewhat doubtful; the one aspect of surgery which we can teach by it is surgical pathology, and the men have had a very thorough grounding in this in the pathological course. It is most important for the students when they become practitioners to know the morbid conditions they have to diagnose. In clinical teaching possibly the surgeons might show more cases of the clinical material at their disposal. A central museum on the surgical side, formed of the pooled collections of all the surgeons, would add materially to the value of the teaching in the Infirmary.

Dr. J. S. Fraser.—There is a great difference in the strength of the medical and surgical schools in Edinburgh—the surgical is acknowledged to be stronger than the medical. I think this is due to the method in which medicine is approached. The physician begins as a general practitioner; in time he works up to be an assistant physician, and later full physician. But even then he is seldom rid of his general practice. Whereas the surgeon starts with anatomy, becoming later a clinical tutor, with time for research work in pathology, etc. Thus he makes a name for himself. What Mr. Grey Turner has said goes to the root of this matter; we want more whole-time appointments. Why should this only apply to the Professor of Clinical Medicine?

Dr. Chalmers Watson.—I am in general agreement with the remarks of Dr. Fraser as to the defective condition of affairs of the medical side of the school at the present time. I cannot subscribe to Dr. Fraser's view as to the efficiency of the surgical as opposed to the medical side of the school. Quite apart from the question of technical skill there is, in my view, the same urgent need for a wider outlook and a more progressive spirit of inquiry on the part of surgeons in regard to many problems that are of joint interest to physicians and surgeons; this is of importance in relation to greater efficiency in teaching.

Comments on the interesting new experiment of the whole-time Chair of Clinical Therapeutics, are, however, comparatively useless in the absence of any knowledge as to the work of the new department. Unless, however, the arrangements for the teaching in that department are made in conjunction with other physicians, there are, in my view, risks that the advantages of the new department may be less than anticipated.

Mr. Cotterill.—The university changed the hospital hour for clinical surgery from 11 a.m. to 1 p.m. to from 12 to 2 p.m. That has been a failure. As long as the eleven o'clock hour was adhered to, the men attended with enthusiasm and regularity. Their interest is still the same, I believe, but now they simply have not the time. Examinations are so devised that they are forced to go to the obligatory classes.

Out-patient teaching is almost the most difficult of all. One has to make an instantaneous diagnosis and to be possessed of judgment and experience—which means that a very competent and experienced teacher is needed. It was a move in the wrong direction when this work was taken out of the hands of the senior men and put into the hands of the juniors, who have not yet got that experience so essential in diagnosis which the seniors may reasonably be expected to have.

Mr. John Fraser.—I would associate myself heartily with the remarks which Mr. Miles has made. One or two opinions perhaps may be worth mention. They are the result of the limited experience one has had in clinical teaching and of the experiences which one had in conducting a short systematic course in surgery, and also from talking the matter over with students. One cannot with any advantage entirely abolish systematic surgical lectures. The successful prosecution of surgery as an art and as a practice is governed by most important basal principles. Those who teach surgery are apt to forget that a large majority of their listeners are not going to specialise in surgery but are going to be general practitioners, hence I believe that the basis of surgical teaching ought to be laid by a prepared course of lectures which makes the student conversant with the basal principles. By these principles I mean such things as shock, hæmorrhage, antiseptics, the process of wound healing, inflammation, etc. These principles are best taught by a series of well-thought-out lectures aided by a series of illustrative cases. But with that consideration my support of systematic lectures would end, for it seems to me that a complicated series of discourses on regional surgery unillustrated by clinical material is a waste of time.

My second point is, that we cannot overestimate the value of a well-considered and thought-out syllabus in teaching surgery. This should be delivered to the student beforehand, and it gives him at once an outline of the course which he is to pursue. This would have many advantages; it would enable the student to gain, by reading, a certain amount of knowledge of the subject with which the lecturer will eventually deal, and by doing so it is but to be supposed that the student would be in a much better position to appreciate the details which will afterwards be given to him. A second advantage is that it largely abolishes the necessity of note-taking. I am not one of those who believe that any man can do two things at once equally well, and if the student is bent upon taking profuse notes, I question if he can apply sufficient concentration of mind to appreciate the points which the lecturer is attempting to bring out.

The surgeon possesses a most valuable opportunity for teaching his students anatomy from the surgical standpoint, and that opportunity lies in the demonstration of anatomy during surgical operations. The anatomy of the dissecting-room, while the same in theory, is often very different from that which is met with in surgical practice, and it is this difference which is often so confusing and perplexing to a student. If, therefore, the attendance of a small body of students was insisted upon during operations, the student will get just that opportunity which he requires for refreshing his knowledge of anatomical details. Take for example such an operation as the dissection for the removal of glands in the neck. It affords a valuable opportunity for anatomical instruction, and I question very much if the teachers take sufficient advantage of it. This is only one illustration, but the principle applies to every part of the body which is liable to surgical operation.

I doubt whether sufficient is made of the time which is already at our disposal. We have heard the suggestion that the medical students' curriculum ought to be extended to six or even seven years, but I wonder if we realise that out of the twelve months of the year the medical student spends five in vacation. There is probably no other probationary period which would shew parallel to this, and, therefore, I would suggest that during a part of these five months the senior student ought to be given opportunity of enlarging his clinical surgical experience by means of a series of classes held during vacation. I quite realise that this would throw an additional heavy strain upon the teaching staff, but there are obvious ways in which this may be met. I am one of those who believe that the student can scarcely begin his surgical clinical work too soon.

For a practitioner to be successful in his surgical practice, the most essential element is that he is capable of using his powers of observation, and further that he is able to interpret these observations, and in other words he is able to make a diagnosis. If the young graduate is equipped with these two essentials, I believe he will find that his success in general practice from the surgical point of view is very largely assured. These are two qualifications which can only be gained by prolonged practice, and surely it is but reasonable that he should begin to acquire these qualifications as early as possible.

Mr. Grey Turner said in reply.—Nobody has taken up the scope of my scheme so generally as I meant it to be taken up. My idea is that in medical schools we will have whole-time professors in practically all the important subjects, plus assistants with salaries, but not such salaries as to make them content to stay there for the rest of their lives. Recognition of their work should be the reward for which they strive. This is a very big matter, which must be started in a small way, unless the State takes it wholeheartedly in hand. I think it will come gradually.

I was much impressed by Mr. Cotterill's remarks on out-patient department teaching. He hit the nail on the head when he said that it ought to be given by the men who have the greatest experience. My opinion is that the cases from the out-patient department for teaching purposes should be sent on to the main surgical cliniques. Everybody in the hospital should be expected to teach, but it would be the business of some of the people to devote the whole of their time to teaching, and they must have the proper material for that teaching.

Mr. Miles said in reply to the Dean that the experiment of holding the special classes from 11 A.M. to 12 P.M. had not been a success, so far as clinical surgery is concerned. The students have become less punctual and less regular in their attendance, and they refuse to stay later than 1.30 P.M. The Honours M.B. degree, he suggested, has nothing in common with the post-graduate degree established by the university. He did not propose in any way to interfere with the M.D. degree, which should remain the hall-mark of the Edinburgh graduate.

XXX.—DISEASES OF CHILDREN: WITH SUGGESTION FOR A PRELIMINARY COURSE IN CLINICAL MEDICINE.

By J. S. FOWLER, Physician, Royal Hospital for Sick Children.

SOME twenty odd years ago the staff of the Children's Hospital were called upon to organise the clinical instruction there, and to decide which diseases should be dealt with and how they could best be taught. They had few traditions, good or bad, to trammel them, and the university gave them an almost entirely free hand both as to matter and method—with the one exception that any systematic course of lectures was forbidden. After much consideration a syllabus was drawn up and classes were started which have gone on twice or thrice a year ever since. As experience was gained the details of these courses have been greatly modified and extended.

We have therefore had a very instructive experience. We started, mainly on our own lines, a new course of teaching in a department of clinical medicine; we have carried it on for many years and have altered it in various directions in accordance with our experience of the success and failure of different methods. Since the subject of the diseases of children is essentially clinical medicine, it is hoped that some of our views regarding the teaching of medicine in general may be thought worthy of the notice of the Club. And it may be added that the position of the class at the end of the curriculum has enabled us to form some opinion as to the knowledge of the elements of clinical medicine which the students possess before they come to us.

1. One of the first points to be emphasised is *the limited value of systematic lectures* on medicine to students who have had no clinical experience of the subject lectured on. In the Children's Hospital, although till lately no systematic course of lectures was allowed, a certain number of class-room meetings were necessarily held on infant feeding, and various other subjects. There has, however, been a tendency to lessen their number, and we are now convinced that there are very few diseases which are not more profitably taught in cliniques to begin with, though occasional reviews of groups of cases or of special symptoms in the lecture-room are useful at a later stage. Such diseases as pneumonia, rheumatism, poliomyelitis, etc., seem to us quite unsuited for teaching in lectures and far better studied in the wards. A few years ago the university, on the suggestion of the lecturers, authorised

a course of ten introductory class-room lectures at the beginning of the summer and winter sessions. Experience has shown that this was a mistake. Even ten lectures given daily are more than the ordinary student can absorb with benefit unless his intellectual appetite is whetted by some intervening clinical study of the same subjects. We have found that the students learn much more from weekly than from daily lectures, and in consequence it is proposed to return to the older system, and to deliver lectures on such subjects as tuberculosis, infant feeding, mental defect, etc., after, not before, the student has studied the subjects clinically.

2. *Preliminary Course in Clinical Medicine.*—Two lessons which we have learned in conducting our own course lead me to suggest that the earlier training of the student in clinical medicine needs revisal. The first and most important of these is the necessity we have been under of teaching a good deal of the applied elementary physiology of children by way of introduction.

Generally, when the medical student begins to attend the Children's Hospital he is absolutely ignorant of the peculiarities of the structure and function of children—even of the commonest facts of the nursery which every mother knows. We have, therefore, necessarily to devote a good deal of the time at our disposal to the teaching of such matters as the rate of body growth in length and weight, the characters and closure of the fontanelle, the development of the digestion and the sort of things a child of a given age is likely to be able to eat with benefit, the development of speech, and of walking and other voluntary muscular movements, and many similar subjects, including the personal hygiene of the nursery. It is only when the student has learned something about health that we can hope to teach him effectively about sickness. This suggests that more time and attention might with advantage be spent on teaching to junior students the anatomy and especially the physiology of the normal body from a clinical point of view.

On entering the clinical wards of the Infirmary the student has not got to learn so much clinical physiology as he has in beginning the subject of diseases of children, but still there is a good deal that he ought to know about the working of the normal body which he has not learned in the excellent classes of anatomy and physiology. Hitherto he has had to acquire this sort of knowledge from tutorial classes and incidentally in cliniques and clinical lectures. We think it would be greatly to his advantage if it could be taught to him more definitely and fully at the commencement of his Infirmary course.

The second lesson we have learned is that a very noticeable proportion of the students come to us with an insufficient knowledge of ordinary physical signs.

From what has been said in previous discussions here, there is a very general desire that the student should begin his clinical work sooner than at present, that he should early become familiarised with the aspect of sick people, and that his physiological, anatomical, and pathological teaching should be better correlated with his clinical work. It may be suggested therefore that a suitable preliminary course might with great advantage be given to all students before they take either ordinary clinical medicine or any of its branches. The supervision and some of the teaching of this class might be delegated by a general clinical medical board consisting of all the teachers to two or three of the assistant physicians, for it ought not to be the duty of a senior lecturer to teach the elements of clinical medicine. There would also be available as teachers clinical tutors attached to the wards, and from the pathological, anatomical, and physiological departments, all suitably remunerated, and possibly senior student demonstrators. The class would last for two or three terms and would cover—(1) Clinical physiology; (2) physical examination in relation to medical anatomy, and especially in relation to morbid anatomy; (3) clinical pathology and instrumental methods, etc.

1. *Clinical physiology* should include some such subjects as the following:—(*a*) Alimentary System.—The healthy mouth and Nature's way of preventing oral sepsis; the process of healthy digestion; the movements of the stomach and bowels and the rate of passage of the food through the alimentary canal—X-rays; the fæces—their physiological variations; defæcation. Physiological digestive symptoms.—Flatulence, colic, vomiting, diarrhœa, constipation, and the results of repletion and starvation; the effects of special diets. (*b*) Skin.—Perspiration, blushing, goose-skin, urticaria, intertrigo. (*c*) Temperature.—Changes from diet, drugs, starvation, excitement. (*d*) Urinary System.—Physiological changes in the urine, physiological albuminuria and glycosuria; tolerance for sugar and albumin; effect of diet and exercise; micturition—effects of foods, exercise, emotion. (*e*) Heart.—Physiological bradycardia, tachycardia, and irregularities; physiological dilatation, murmurs, and venous pulsation; effect of respiration on the pulse; the heart in debility; cardiac instruments. (*f*) Distribution of pain in visceral disease. (*g*) The effect on the functions of the body, and on symptoms generally, of exhaustion and debility, of pregnancy and the menopause, of old age. (*h*) Physiological Therapeutics.—A selection of the following subjects might be considered: Keeping well. Personal hygiene—skin, hair, etc. Clothing—too much and too little. Washing and bathing—hot baths, cold baths, etc. Fresh air and sunshine—effects. Diet—for obesity, malnutrition, constipation, etc. Alcohol—effects in moderation. Tobacco, tea, coffee. Alkalies—effect on the body generally, on the urine. Laxatives. Enemata—purgative and nutrient. Saline infusions.

2. *Physical Examination.*—Physical signs are neither easy to learn nor easy to teach. What is important is that when a man graduates

he should be able to detect well-marked signs, and to feel confidence in his findings. For instance, when a student is really sure of bronchial breathing, he has gone more than half way towards mastering auscultation of the lungs. The teaching of physical signs should therefore begin with and give most prominence to the really important—what may be called pathognomonic—signs, rather than work through a systematic schedule such as is given in books, in which a good deal of space is naturally taken up with relatively trifling variations from the normal. For actual practice in learning physical signs students should not work in groups of more than five to ten. To make the best of the material available the whole resources of the medical side would have to be pooled (possibly other institutions such as poorhouse hospitals might also be utilised), and therefore the students in this introductory class would not attach themselves to any one physician—the class would be quite independent of the later ward teaching by the various lecturers. Applied anatomy should be taught by the anatomical tutors in connection with the class, and, what is even more essential, physical examination should be brought into very close relation with pathology—naked-eye pathology in the first place, laying great stress on the way in which morbid processes produce abnormal signs—the physics of the process. A collection of teaching specimens made from this point of view would be of great value, and it should be the duty of the tutor, when a patient dies, to demonstrate on the organs the changes which have caused the signs that the student has heard.

The idea underlying this course so far has been to give the student ward instruction in really important and practically useful matters which yet require no previous knowledge of medicine beyond what has been obtained in the departments of anatomy and physiology, and, second, to give him a good knowledge of the tools he will have to use later, without which no progress is possible.

3. *Clinical Pathology.*—Differences of opinion will exist as to how far these ordinary tools should be supplemented by more elaborate methods. My own opinion is that an average student should be expected to know practically only such methods as a busy practitioner will have time to use in his future work, but that he ought to know about as many others as possible. He should therefore be taught, and know how, to collect material properly—in what sort of case, and at what stage of the case—how to do lumbar puncture, puncture of the chest, how to get blood for blood-culture, to get sterile specimens of urine, how to make and stain blood-smears, how to use the ophthalmoscope sufficiently to recognise choked discs, how to stain for tubercle bacilli—in short, any test that is trustworthy and that does not involve the expenditure of time. With respect to more lengthy instrumental or laboratory methods, it may be suggested that these should only be demonstrated to the ordinary student, or at least that time

should not be expended on them to the detriment of other work. What the ordinary student ought to know is, how to make proper use of the clinical laboratory.

On the other hand it might be feasible to increase the opportunities of the senior student who is above the average in two ways: (1) By allowing such men as for instance are likely to become house physicians after graduation to act as clerks in the clinical laboratory. (2) By utilising their services as student demonstrators in the preparatory course.

In addition to the three main branches of the course, I should like to propose a fourth form of instruction, given by the senior physicians. Once a week, each student should attend a short ward visit, at which the obvious features of typical cases of disease—Bright's disease, pneumonia, hemiplegia, heart disease, for example—should be pointed out. Not more than two or three minutes need be given to a case, and as a rule the examination would be limited to inspection. It is very important to begin early to familiarise the student with the look of sick people and the more striking forms of disease. Besides this the senior lecturer might sometimes lecture on special symptoms to the class—cough, headache, convulsions, insomnia, and the like.

At the end of the course the students would be required to pass a strict practical examination on the subjects taught before proceeding to clinical medicine proper. After working through such a course they would be enormously more interested in, and more receptive of, instruction in clinical medicine, and incidentally in that part of it which plays the title-rôle of this paper.

With regard to diseases of children, the time allotted (two hours a day on three days a week for medicine during one term) is sufficient. The chief drawback under which we labour is that which was emphasised by Dr. Norman Walker at a previous meeting—that it is all compressed into one term. It would be better were it spread over a longer period and taught concurrently with general medicine, provided that the preliminary training in physical diagnosis, etc., is adequate. At one time we thought that it ought to be taught after and as an extension of the rest of medicine, but, after all, disease occurs in childhood in simple uncomplicated forms, usually giving a clear-cut clinical picture, most of the patients bear examination well, and experience leads us to think that the students would benefit by beginning it at about the same time as the rest of clinical medicine. Another strong reason from our point of view for spreading the course over a longer period is that, on account of the seasonal incidence of many of the diseases of children, the men would see a greater variety of cases. At present those attending during the autumn often see quite a different set of cases from those which occur in the wards during spring and summer. But, however the course may be altered, it is essential that the present system of small sections, not exceeding ten to twenty men, should be retained.

The question of teaching infant feeding practically is difficult. The students are lectured to on the subject, but do not by any means get a practical acquaintance with it in the hospital, for the very good reason that the larger part of the subject is preventive medicine, deals or ought to deal with how to keep healthy babies well, and that the hospital does not handle such cases. Now that preventive welfare centres have been established in Edinburgh they should be utilised for teaching this important subject. At present we have no material for showing the student how to manage a healthy infant from birth onwards. Many of the cases he sees in hospital are calculated rather to make him despair of success than to show him how the thing should be done. Another flaw in the present course of children's diseases is that the students do no case-taking. Case-taking involves the getting of the histories from the mothers, and this has always been a practical difficulty. This part of the course could best be carried out in connection with the out-patient department, because taking cases in the wards, without interviewing the mothers, would have comparatively little educational value.

At present the students know that they will not be examined on diseases of children, and, naturally, they tend to pay less attention to it than they would were it one of the final subjects. It ought, therefore, to be represented, in some way or other, at the final examination.

XXXI.—THE TEACHING OF THE SURGICAL DISEASES OF CHILDREN.

By JOHN FRASER, Assistant Surgeon, Royal Hospital for Sick Children.

The first thing I would do is to draw your attention, in passing, to the very special importance which should be attached to the surgery of childhood. I do not mean to infer that it is more important than any other branch of surgical work, but there are certain underlying difficulties which never should be lost sight of.

The first of these is the special type of subject with which one is dealing. Childhood is probably the most sensitive of all the periods of the span of life. It is a period which, while marked by extraordinary powers of recovery, is also signalised by a condition in which resistance is often very low, and surgical work practised during this period has continually to be modified by these two features. Secondly, there are difficulties in the clinical diagnosis and examination of children which are not met with in adult work. Time and again you find that you get no help from the child itself, but instead you are met with a passive, and even active, resistance. This is a difficulty which is very real in clinical work, and it can only be overcome by patience and experience. In children one is dealing with the source from which the manhood and womanhood of the nation is eventually to be drawn, and errors in diagnosis and treatment during this period will react throughout the whole future of the individual's life. There are other complexities which I need not mention, for I have said sufficient, I think, to show the special importance which should be attached to the surgical work of childhood.

Now, one has to ask oneself two questions: First, is the present system of educating the student in this branch of work satisfactory? and secondly, if it is not satisfactory, how can it be improved?

In regard to the first question, what is the scheme which is at present in vogue? The student for a period of three months attends the Children's Hospital, and during that time he has an opportunity of attending four surgical cliniques a week—two in the wards and two in the out-patient department. I say that he has an opportunity of attending these cliniques, but in actual practice one finds that he is not always very conscientious in taking advantage of them. No opportunity is afforded him for case-taking. He is encouraged to attend the operative work of the hospital, both the indoor and outdoor work, but in regard to the latter, and from the point of view of the practitioner by far the most important, one finds, with the exception of a few keen spirits, the opportunity is ignored. I daresay that with the last, one may have some sympathy, because these operations take place at 9 A.M., and this for the average student is a most unearthly hour. Such is the theoretical basis on which the work is organised, and while in theory it may appear satisfactory, I believe that in practice it leaves several things to be desired. Such is the answer to the first question, and answering it as one has, it is incumbent upon one to make some suggestions by which one believes that the opportunities for teaching could be improved.

First, let me say that in the surgical work of the hospital where the commoner maladies are concerned there is no lack of material and it is with these common maladies that the student ought to be thoroughly conversant. Now, the first suggestion I would make is that the surgical work of the Children's Hospital ought to be more closely combined with and made concurrent with the clinical teaching in the other institutions. At present the student feels that it is more or less a side issue. He believes that in his professional examination he is unlikely to be troubled with many questions which are specially related to children.

Secondly, I believe that the period which is at present allotted is insufficient, namely, three months; at least six months are necessary.

Thirdly, the system ought to be so altered that an opportunity is given to the student for individual case-taking. That during the period while he is attending the hospital a definite series of cases, well illustrative of children's diseases, ought to be allotted to him. He should be made responsible for the taking of the cases, and, if possible, in each case he should write a short commentary upon them.

Fourthly, one would like to see his attendance insisted upon during the operations which are necessary upon these illustrative cases, and while he is in attendance the important anatomy should be demonstrated to him.

Lastly, I believe that his attendance at out-patient operations should be made compulsory, and, where the minor work is concerned, an opportunity should be afforded him of carrying out under supervision a series of operations illustrative of these minor maladies. Take, for example, such a thing as circumcision. There are very few students who go into practice having done one of these so common and yet so important operations, and there are very large numbers who begin their practical work without ever having seen one done.

There is one more point I would like to make. A great portion of one's work in a children's hospital consists of orthopædic surgery, and I can imagine few things which are more important in general practice than this. At present the average student is often very little conversant with it, and it is a subject which can be very admirably illustrated in the wards of a children's hospital. I believe that some attention is necessary for the further development in Edinburgh of this most important branch of surgical work.

These are some of the points which one would like to bring forward. One realises that there are many difficulties in the way of their fulfilment, and I daresay that some of the suggestions may appear unnecessary, but it seems to me that to do justice to this very important branch of surgical work they at least ought to be considered.

XXXII.—DISPENSARY PRACTICE AS A PART OF MEDICAL TRAINING.

By JOHN ORR, M.D., F.R.C.P., Physician to Western Dispensary, Edinburgh.

Dispensary practice has for long been an integral part of the medical curriculum in the Edinburgh school, and has proved itself to be of value in the clinical training of the medical student.

Charitable dispensaries began to exist at an early date in Edinburgh, for we find that the Royal Dispensary was established in 1776, and is still in active operation. It was followed in 1815 by the New Town Dispensary, and then by the Cowgate, Western, and Provident Dispensaries, so that now the charitable dispensaries have come to constitute a more or less complete system for the provision of attendance on the sick poor throughout the various districts of Edinburgh.

From an early time in their history the dispensaries mapped out the city into areas, each of which was attended by a dispensary, and patients have come to know that those resident in a particular district are attended by a particular dispensary.

The clinical material was utilised for the teaching of students, but it was quite a considerable time before recognition of the dispensaries as teaching centres was conferred on them. The University Ordinance of 1861 contains a paragraph to the effect that it shall be a necessary part of the student's curriculum to attend dispensary practice for six months, although it is right to say that he was given the option of attending the practice of a physician or surgeon; and this regulation was the cause of a good deal of improvement in the teaching methods which prevailed in the dispensary clinic. This regulation is embodied in the Edinburgh University Calendar of 1864. I am not aware that there is any other medical school in this country which insists upon students attending dispensary practice, solely, I fancy, because charitable dispensaries of the kind we have in Edinburgh do not exist in the cities where other medical schools exist. One is certain, however, that if they were available in other cities the medical school would not fail to avail itself of such clinical facilities.

The value of dispensary practice is now well recognised as a training-ground for the young teacher of medicine and for the senior student beginning, for the first time, to accept the individual responsibility of general practice. There is, therefore, at the present day no apology needed for the existence of these dispensaries as teaching centres, and it can scarcely be doubted that dispensary instruction is of considerable importance in supplementing the teaching of clinical medicine.

I take it that the discussion to-night is meant to ascertain if the best use is being made of the clinical opportunities of the dispensary, and I may recall to your minds what is being done in most dispensaries.

The work of most dispensaries consists of—

Firstly. The seeing of out-patients daily by the physician on duty.

Secondly. The attendance, at their own homes, of patients who are unable to attend the dispensary personally.

Thirdly. The seeing of special cases—ophthalmic, laryngological, gynecological, and special surgical cases—by specialists duly appointed for the purpose.

Fourthly. The dispensing of medicines from prescriptions for the cases treated both at the clinic and at patients' homes.

I. The clinic of the dispensary has usually been conducted by a young physician, and, as a rule, the physicians who have undertaken this work have been men who have been aspiring to a position of assistant physician, and ultimately physician, to a hospital; and in most dispensaries it has been regarded as a *sine qua non* that the candidate for the post of physician of a dispensary should be a Member or Fellow of the College of Physicians or Surgeons.

The experience gained by the physician in teaching at these clinics has been most valuable to the individual. It has trained him to handle patients, and to expound to the students the various clinical points which have cropped up.

But important though this side of the question is, it is not so much so as the other, that is to say, the student's point of view. Here, for the first time almost, the student comes in contact with the various so-called minor ailments. He observes how the trained physician handles the patients who come before him. It is to be remembered in this connection that the patients are not selected patients; that is to say, they are not all ear cases, or eye cases, or surgical cases, but are unassorted cases of disease requiring treatment.

The student further sees how the physician in charge ascertains what the nature of the person's malady is, makes his diagnosis, explains his treatment, and dictates a prescription, or gives dietetic or other recommendations to the patient; or, if the case be one which requires special elucidation, the student observes how this is determined and referred to a special department or hospital.

The method of handling patients, of ascertaining leading symptoms and physical signs, and coming to a conclusion as to the case, is, in some respects, something new to the student. In the clinical wards he has been accustomed to seeing the results of such investigation when the case has been diagnosed, when the physical signs have all been ascertained and noted, and treatment in part carried out. He has previously only seen the finished diagnosis, whereas here he sees the diagnosis in process of evolution, and he is bound to learn a great deal from a dispensary teacher who is competent and interested in his work, and who is able to instruct the student in the best ways of attaining the end in view, viz. accurate diagnosis.

But the student also has the opportunity afforded him of seeing how the cases should be managed where there may be little or nothing wrong with the patient, or where there may be no abnormality, but the person imagines that there is illness present which has no foundation in fact. In short, he is shown in dispensary practice practically all the features which he may reasonably expect to meet in private practice. The dispensary, indeed, is a true mirror of what he may expect to find later in his own consulting-room.

Yet another point of importance may be noted here. In dispensary practice the student is shown not only these points referred to, and notes the treatment which is indicated, but he is also enabled to see the results of treatment, because the patient is asked to return on a certain day and report himself, and the student is able to trace the effects of treatment in every case under review.

Still further, many of the cases which come into dispensary clinics are of mild character—indeed, they are often the beginnings of disease, and it is rendered possible for students in many cases to see the beginnings of disease and to trace some diseases from the very early stages throughout the entire course until, finally, the case is recovered. For example, it is sometimes possible to see a case of herpes on the first day, when there is a rather indefinite papulation over certain areas, and where it is possible even at this early stage accurately to indicate, from the distribution of the lesion alone, that the case is one of early herpes, and the further development can be followed as the patient returns from time to time. Other examples occur to me, but it is unnecessary to elaborate further the use of dispensary practice from this point of view. It will be in the recollection of many that we recently had the opportunity of hearing Sir James Mackenzie and Dr. Robertson speaking as to the value of the recognition of early symptoms of disease, and of the great importance of prophylaxis in disease, and it seems to me that the importance they attach to both these matters has long been recognised and pointed out by dispensary physicians to their students. There can be little doubt but that many diseases which might otherwise attain a serious character are arrested in the stage of the initial manifestations by the timely attendance of the patient at a dispensary, and the student is enabled to see these early cases and to observe how they should be handled, and in many cases, as I have shown, to see how they develop if unchecked.

Another feature of the clinic, and nowadays more than ever valuable, is that the physician is asked to furnish a certificate, for various reasons, to the patient. Certification, unfortunately, is becoming rather a burdensome feature of medical practice—burdensome because of the multiplication of certificates which seem to be requisite. Patients come asking certificates from the physician—certificates for various purposes—and state their requirements with complete truthfulness and a show of reason; but they often ask a certificate for a condition which may be outwith the physician's personal knowledge, and it is then the duty of the physician to point out to the students that a certificate should not be granted unless the facts stated in the certificate are facts which are within the certifier's personal knowledge. For example, the patient may say he has been ill for a week prior to seeing the physician, and the physician has no doubt in his own mind that such may have been the case, especially after he has examined the patient. But in so far as the physician has only seen the patient for the first time he is unable to certify that his patient was actually ill a week previously. It is thus very important to point out to the students the necessity of being excessively careful in granting certificates. A simple exhibition of such a case, and the points connected with it, are invaluable to the student and will be impressed upon his mind far more than by any amount of lecturing.

Again, the student learns much with regard to the incubation of infectious periods of the various exanthemata which break out very frequently in families, and the physician is consulted as to the possibility of certain other members of the family attending school, etc. The student thus learns by the physician's questioning of the patient as to the beginning of the case of infectious disease, and how he must deal with cases which have been exposed to infection.

II. The out-door visiting of patients by students is perhaps the part of medical work from which students shrink at first more than any other. They feel the responsibility of attending patients on their own account—and rightly so. The more students feel the responsibility on these matters, the better practitioners they are likely to turn out, simply because they are likely to realise their onerous responsibilities with regard to the sick. As a rule I recommend that students go in pairs—the one acting as a moral support to the other—and they very soon learn how to deal with these patients at their homes; and when they are in difficulty—as they usually are with their first cases—they feel that they can rely upon the assistance of the physician in charge, who will go and see their cases with them, and will help them in their beginnings of practice.

At first many students have a very distorted idea of the value of symptoms and of physical signs, and it is only after practice in the personal management of cases that they begin gradually to appreciate the relative importance of various symptoms. It is here that the physician can help these students enormously by pointing out the various shades of difference that exist between the symptoms which they encounter. The symptoms may be the same, but are of varying importance according to their severity and their association with other clinical features. Many students think all cases with coughs are pulmonary tuberculosis, and take a highly magnified view of the severity of the case they are treating, and it is only after a little while that they begin to appreciate, under guidance, the relative value which these symptoms possess.

Further, they acquire gradually a facility in writing prescriptions for the cases they attend. At first most students have the utmost difficulty in writing prescriptions of any sort, and many of them use booklets containing ready-made prescriptions for various diseases. I am very much against the use of such booklets, because they tend to make the student give so-and-so for bronchitis, so-and so for heart disease, and such-and-such a formula for kidney disease, without definite reference to the particular manifestations of these diseases, and I insist upon students giving attention to the special symptoms which present themselves in their patients, and of treating these to the best of their ability. In certain cases students are very keen on out-door practice, and get through a great deal of useful work, and the more cases they attend, the more capable do they become in the handling of the patients in their charge, and they rapidly gain confidence in their own powers.

The special departments of eye, ear, and throat, and so on, are not usually attended by the students, because the hours are not as a rule suitable, and the number of cases attending scarcely make it worth the student's while to attend. At the same time the opportunity exists, if they care to make use of it, and those who have time do so.

Attached to most dispensaries there used to be a midwifery department (now merged in the Maternity Hospital), and there is a vaccination officer who conducts special practical courses. Most students take out vaccination in the same dispensary at which they do their cases. It is not my intention, however, to say anything about this matter to-night, as I understand it will be referred to by others, but it is wise that vaccination should be associated with dispensary practice, as in a dispensary one has, practically speaking, a mirror of all the pieces of work which go to make up a general practice. I think that the greatest possible use is made of the clinical material of the Edinburgh dispensaries by the physicians who are attached to them; and the interest shown by the students, coupled with the regularity of their attendance, is, I think, sufficient evidence that they appreciate the lessons that are taught them there, and the efforts made to elucidate the cases which come under observation.

In conclusion let me say that I am of opinion that dispensary practice should be taken late in the curriculum if the student is to obtain the greatest benefit from it. He ought not to come before his fourth winter session, and, indeed, if he came in his last winter he would be in the best position to gain the most advantage from it, for by this time he has already attended medicine, clinical medicine, and possibly fevers and skin diseases, and is now in a position to apply his knowledge to patients who may come under his care.

The university has a direct interest in the teaching at the dispensaries, and it may one day be considered desirable to associate in a closer fashion than exists at present the dispensary physicians with the university staff. Whether this happens or not, I am certain that the dispensaries play a useful, if unobtrusive, part in the training of the medical student.

XXXIII.—THE TEACHING OF VACCINATION.

By W. G. AITCHISON ROBERTSON.

We all agree that every student should be taught how to vaccinate. We, who teach vaccination, are appointed directly by the Local Government Board, and they, through their inspectors, see that the work of teaching and the practice of vaccination are carried out in the best manner. It is an important matter that each individual student should be taught the necessity of vaccination. There is all the difference in the world between efficient vaccination and so-called vaccination, and it would be a good thing if many of our older practitioners were to attend a present-day course of vaccination instruction. A single inoculation is not sufficient for all-time protection against smallpox. The Local Government Board lay down a rule that all public vaccinators and teachers of vaccination must put four inoculations on the child's arm, and that the total area of vesiculation resulting must at least amount to one-half square inch. I think that at present all students coming to the class of vaccination are taught to vaccinate efficiently, and are thoroughly impressed with the fact that by so doing they will protect the child for many years against the chance of smallpox infection. In the vaccination course we allude to inoculations generally; we describe the after-effects of vaccination, the method of carrying it out, the asepsis to be practised, and the complications to be guarded against. We urge the necessity of revaccination. To get into the course all we desire, we cannot do without the six lectures and practical attendances granted us. One of the registrars in Edinburgh told me recently that the number of exemptions through the Conscientious Objection Clause was fully 30 per cent., and in England it sometimes amounts to 50 per cent., or even 60 per cent., of children who are never vaccinated at all. This large number of unvaccinated people constitutes a very real risk to the community. All these points are put before the students. I usually give a lantern lecture showing the development of the vesicles from day to day, and how the lymph is prepared. The public health aspects, and finally the legal aspects of vaccination, are alluded to.

DISCUSSION.

Dr. Fleming.—I have always held that the ideal method of teaching clinical medicine would be to have the pathological specimen in the bottle at the patient's bedside—which is of course impossible. I have, however, endeavoured in teaching, say heart disease or lung disease, to give my students a demonstration of the specimens which I possess, and this helps the men to understand the physical signs better. It would be a help to those of us who do not possess museums if the Pathological Department would give demonstrations on, say, the diseases of the heart while we are giving cliniques on heart disease at the same time.

The dispensary is enormously important, and I would lay stress upon the fact that one of the ways in which a student can learn most there is by taking cases himself.

Dr. J. G. Cattanach.—I remember that this Club took considerable credit to itself for the new Ordinance of 1911, discussed first here and carried out almost entirely at the Pathological Club's suggestion; and it is only right that they should do something to remedy some of the faults that were foreseen by some of the teachers when that Ordinance came into force, *e.g.* the entire ignorance of physical signs shown by so many of our students. This is a serious fault in our Edinburgh school. A great fault lay in abolishing the tutorial system of evening classes in the Infirmary. The scheme under which we are working just now practically closes the wards to the students.

A point in Dr. Fowler's paper which impressed me was his desire that the students should see the children at seasonal times; and I think the suggestion that came from Dr. Fowler and Mr. Fraser in connection with surgery of a six months' course in children's diseases is one which should be insisted upon.

I think we are the only school who have compulsory dispensary training. But those of our men teaching in other schools have told me how greatly they miss it. I think, however, if it is not compulsory for the students it should certainly be compulsory for any young man who is going to be a teacher in our Infirmary. Should not the university have some say in selecting the teachers who are doing the dispensary work? They should take some steps to see that the man in the dispensary is able to *teach.* I would put in a plea, too, for the six months' dispensary training that the Ordinance specifically states as a requirement. The Ordinance says "six months" with no qualification, but shortly after 1892 the clinical medicine teachers suggested and carried through an unwritten law by which, if a man takes an extra three months of clinical medicine he is exempt from three months' dispensary teaching.

If a man gets a little actual work to do, *e.g.* a small operation, he comes regularly to the course from start to finish. The student is keen on his work if he is made interested in it, and the slackness of the slacker may sometimes be due rather to the teacher than to himself. The material got at the dispensary is just the kind of material that the man meets with in beginning practice.

Dr. R. Robertson.—I can only speak as a general practitioner who has been in practice for nearly thirty years. In the last thirty years there have been tremendous changes. When I started practice it was much more common to attend cases constantly from the beginning to the end. Now a transition is taking place and the work is being more and more taken away from the general practitioner. It is now even becoming an uncommon thing for a general practitioner to give an anæsthetic. The child-welfare scheme is going to cut still deeper into the general practitioner's work, and the venereal diseases are going to make a further inroad into it. The developments in recent years of surgery, and consequently the institution of nursing homes, circumscribes still more his sphere. This raises the question : What type of practitioner are we going to have in the future? The teaching depends upon the answer to that question. As far as I can see, the general practitioner is only going to be a kind of clearing-house to send the patient here or there. I think the present type of general practitioner is going to disappear from Edinburgh, and this being so, I agree with Mr. Miles—though from rather a different point of view—that we should institute two degrees in medicine. One degree on a fairly low standard will be required. The fault of the present teaching is that every teacher thinks his subject is of paramount importance to the exclusion of every other subject, and the examinations set render it necessary for a man to be really familiar with the subject, *e.g.* in anatomy a world of detail is taught which might very well be left out. The theoretical side of medicine is treated too seriously, and insufficient attention is paid to the practical teaching. I think also that the chemical side of physiology and pathology might better be taught through a special Chair of Medical Chemistry, which I understand is soon to be instituted. Medical education should be a real education in the sense that it should not consist in cramming into a man's brain all that it is possible to know about the subject, but should teach him where and how he can get knowledge, for medicine is rapidly crystallising along the lines of specialisation. The danger of this over-specialisation is to tend to narrow a man's breadth of mind.

The dispensary work should be associated with the general practitioners in a greater degree than it is. The teaching of a knowledge of human nature is a most essential thing for success in general practice, and in this respect experienced outside general practitioners could be of immense help to the students.

Dr. Chalmers Watson.—It was part of the scheme put forward by the assistant physicians that more intimate relations should be established between the clinical department and the dispensaries, and that the teaching at the dispensary should rank as an integral part of the curriculum. The assistant physicians also suggested the advisability of the teacher at the dispensary having some intimate relation with the university proper. The suggestion we made there was that there should be a three months' course for medical students prior to their actual work in the wards—these three months to be devoted to the study of physical signs ; and that a part of the instruction in that course could very properly be given by one of the teachers of the Sick Children's Hospital, thus intimately associating it with the subject of clinical medicine.

I am not in agreement with Dr. Robertson when he suggests the establishment of a degree of a lower level. I would strongly deprecate any scheme which has as its object the lowering of the present standard. The present minimum standard, on the contrary, should be very materially raised, which does not, of course, negative the advantages of an additional degree. The more we educate the student, the more, I think, do we enable him to appraise the value of modern methods of investigation. One constantly comes across general practitioners with cases where investigations of some length have to be carried out, and far too many of these general practitioners have very little interest in the nature of the investigations or any desire to know anything about them. This brings me to one of the difficulties under which the clinical teacher labours at the Royal Infirmary. We there have facilities for making careful X-ray examinations as often as we want; we can get bacteriological examinations done very frequently. One of our objects should be so to correlate the particulars ascertained by these means with the clinical signs that the student can draw his conclusions without necessarily having recourse to those first investigations. This forms an added reason for my opposition to Dr. Robertson's idea of lowering the standard.

Mr. Miles.—I should like to enter a protest against the idea that I proposed any lowering of the ordinary degree. My whole proposition, on the contrary, was that by making our teaching simpler and less elaborate we might raise the Edinburgh degree because the man would go out knowing a great deal more than he does now.

I agree with Dr. Fowler in his plea for an elementary course in medicine, partly because it would influence the teaching of surgery since the men would come to us better prepared.

I hope we will be able to co-ordinate the teaching of surgery in the Sick Children's Hospital with the teaching at the Infirmary. By arranging a syllabus we could arrive at some means of giving the students a knowledge of the elementary surgery they require in practice, and particularly in conducting these small operations referred to by Mr. Fraser. At the dispensaries minor surgery can be very well taught, the students doing the operation under the supervision of the surgeon.

Professor Lorrain Smith.—We should not lose sight of the contention in Dr. Fowler's paper to bring in physiology and pathology as contributing to the teaching of the early parts of medicine. Dr. Fleming alluded to that by suggesting that the pathologist should provide specimens to illustrate the cases, but this would not get over the difficulty. We probably do teach pathology quite sufficiently just now to explain how the disease process disintegrates the various functions and organs which it attacks, but as far as I can make out from this and other discussions, we do not teach either physiology or pathology sufficiently to introduce the student to an understanding of the signs in a living patient, or how they are caused. I do not know that I can suggest the remedy for this. I wonder if the records that we get are insufficiently detailed on that point. Certain it is that we break down somewhere in the teaching of pathology in the interpretation of physical signs. The student should be master of the physical signs before he comes to the ward to study cases, and this being so, the preliminary subjects of physiology and pathology ought to help in this instruction.

Dr. Robertson is mistaken in the idea that the teachers of the scientific subjects are in any way attempting to push their subjects to the exclusion of the central subjects of the course, viz. surgery, medicine, and midwifery.

Dr. Orr.—I may perhaps illustrate what Dr. Fowler has in his mind in regard to physical signs in this way. One has, say, a case of pleurisy with effusion. One asks the student why in such a case we are unable to hear breath signs at the surface of the chest. The almost invariable answer is that fluid is a bad conductor of sound. That is partly true and partly untrue. Fluid *is* a very bad conductor of sound if the vibration is in the first place produced in another medium. When the sound vibration is transferred from one medium to another it suffers an enormous diminution. If then passed into a fluid, it suffers a further diminution of sound. The student is not taught that if a sound vibration is produced in a liquid medium in the first instance, the liquid medium conducts the sound admirably. Again, the student cannot understand why in a case of sarcoma of the lung there is nothing heard over the chest-wall, because the sound vibration produced by air in the first instance is transferred to a solid medium. It is the half-truth that creates the difficulty.

Dr. Eason.—In consultation with the assistant physicians, I was responsible for suggesting that a preliminary course should be held in the study of physical signs of health. I feel very strongly that at the present time, and especially since the fairly recent changes in the medical course, this course is more than ever a necessity. It was not so necessary when the student took up the study of clinical medicine after the study of surgery, and so at a later part of his course. I am therefore in agreement with the tendency of the last few meetings and with Dr. Fowler as regards this preliminary course, but I think it would be a mistake if in it any reference whatever were made to the subject of disease or morbid conditions. The student must get a fair grasp of the signs of health before coming to this at all. If he studies the two together confusion will result in his mind.

Dr. Ker.—We all agree with Dr. Fowler and Dr. Eason that a preliminary course of physical signs would be an advantage. But does Dr. Fowler propose to add any more time to the curriculum for it? Restriction of such a class to five or ten men would present a very practical difficulty. Mr. Fraser's suggestion of a six months' course instead of a three months' would be very difficult to arrange. Another point which interests me extremely is the seasonal question. We have certain diseases more or less epidemic at certain seasons—for instance, measles. Sometimes years have passed during which the student of the autumn course has not been able to see a case of measles. Of course, while all these things are extremely useful, to carry them out we must cut down something. We should therefore limit the teaching to things which are really useful to the general practitioner: for instance, only a broad general idea should be given of nervous diseases, and a man should not be rejected in his examination because he does not know the exact lesions in some obscure case of nervous disease.

The full six months should be exacted for dispensary teaching. It is *very* useful to the men afterwards, and is one of the best points in the Edinburgh teaching.

Dr. Fleming.—Let me explain what I mean by having a pathological demonstration of specimens in connection with clinical teaching. In teaching mitral stenosis, for instance, I first give a clinique on that subject, and then bring up a great many specimens, showing why the left auricle becomes so big, and so on. A collection of typical specimens from the Pathological Department which could be gone over by the teacher in the earlier part of each summer and winter session would be very instructive to the student.

Dr. J. S. Fraser.—There ought to be a syllabus in every class of what it is essential that the student should be shown. The men may be shown many other things, but there ought to be an irreducible minimum of cases of each particular sort which they ought to see.

Dr. Chalmers Watson.—It would increase the value of pathological and clinical work—especially in cardiac and lung pathology—if we had a clinical-pathological museum in the Infirmary, for I do not see how this co-ordination can be efficiently effected unless the specimens are in some museum in more immediate relationship to the wards. In addition to the pathological specimens, X-ray photographs of different stages in the clinical history taken during life would aid both teacher and student materially in this co-ordination. It would be useful, also, if we could have X-ray photographs of the cadaver.

Dr. Traquair.—As for raising or lowering the standard, I have always imagined that by Mr. Miles' scheme it would be raised for the lower degree, because the student would have, I understand, certain things cut out from his curriculum, as, for instance, a knowledge of the intricacies of difficult surgical operations, but that he would be examined and passed on a standard of about 100 per cent. as to his knowledge of simple things. The essential thing is that the student should not be allowed to graduate unless he knows thoroughly the things a young general practitioner ought to know.

The meeting to-night interests me in that it is the first to deal with special subjects. Here again the question of time comes in. Which special subject is the most important one? It seems extraordinary that diseases of children should have almost as little time allotted to it as diseases of the eye, ear, or skin. A very large proportion of the general practitioner's work will be amongst children. If any course has a claim to extended time, it is surely the one on diseases of children.

I think what Mr. Fraser said as to the surgery of children having no place in the final examination is sound. The students know that their passing or failing is not dependent on that class, and therefore do not pay so much attention to it as they might.

One feels that special subjects might be presented to undergraduates rather as a part of clinical medicine and surgery than as specialities. The teaching might be limited to the essentials, but the student should be expected to know these essentials up to the general standard of the final examination. The teaching of special subjects as such might well be cut out of the undergraduate course.

I have often wondered whether nothing could be done by making a post-mortem examination more or less into a clinical lecture. I have often felt in regard to eye cases that I would very much like to be present at the post-mortem examination to see the inside of the head and eye, but up to the present such opportunities have been rare.

Dr. Fowler said in reply.—A most important practical point is whether the course I suggested would increase the curriculum. I do not think it would, for I do not propose to teach the students any more than at present. In mentioning the size of the class as five or ten, I was speaking specially of one subject—physical signs—which must be taught in small sections. The whole medical side should ba thrown open, and the men of course would not all be doing physical signs at the same time. With regard to extending our own course, I do not ask for more time, but simply a rearrangement. Why should something more not be done for fevers? Why should the men not come out in sections for nine months once a week?

With regard to the teaching of physical signs in relation to morbid anatomy, I said less about pathology because I know that pathology is the one subject already taught in relation to clinical medicine. A good deal of the difficulty about relating pathological specimens to signs is probably due to the fact that the pathologists do not get the data. I think also that when a post-mortem examination is made, the clinical tutor who knows what the signs during life were should be there to explain them to the men.

I was glad to hear from Dr. Chalmers Watson that this scheme falls in with his suggestions. The difference in mine is that I antedate it and that it should be run independently of ward cliniques. I agree with him about the value of radiographs. I find them very instructive for myself and for teaching. I did not make any suggestion that the Sick Children's Hospital should be associated with the preliminary course: I must admit I did not think of it. Dr. Eason thinks we should begin with the signs of health only. That is quite true in a way, but it might make the teaching rather academic, and my idea is to make the course interesting, and that is why I put in the short ward clinique once a week.

Dr. Orr said in reply.—I quite agree with Dr. Cattanach that minor operations should be shown to the students. For long I have done so, and sometimes I have shown them larger operations. I think what Dr. Traquair was pleading for, viz. the correlation of special diseases with ordinary general diseases, is best shown in dispensary work, because there the physician in charge has an opportunity of getting many eye and skin cases coming in for ordinary treatment, and it is a very pleasant duty to show how these special diseases are associated with ordinary systemic constitutional causes.

XXXIV.—THE EDUCATION OF STUDENTS IN VENEREAL DISEASES.

By BREVET-COL. L. W. HARRISON, D.S.O., K.H.P., R.A.M.C., Officer-in-charge and Lecturer in V. D., Military Hospital, Rochester Row.

I SHOULD like to discuss the education of students in venereal diseases from three points of view: (1) Its present deficiencies, as judged by results; (2) the necessity of remedying these deficiencies; and (3) the lines on which I think that the student should be educated in venereal diseases.

To consider first the deficiencies of the student's education as judged by results. From 1910 until the outbreak of the war I was teaching venereal diseases to newly joined officers of the R.A.M.C., which was then attracting the best men from the medical schools. I came to the conclusion, from conversations with them and from the questions which they put to me, that if venereal diseases were being taught in the medical schools the effect was very slight as regards the imparting of any useful knowledge of the subject.

In 1913 I stated in my evidence to the Royal Commission that many of the evils due to venereal diseases could be prevented if general practitioners knew more about their modern diagnosis and treatment. I was then told that this defect in their education would probably soon be remedied, as examiners were beginning to ask questions on the subject, and medical schools would soon find that it did not pay to neglect it. I do not know to what extent the student's knowledge is tested at the present time, but some little time ago I was told by a specialist in venereal diseases, who is an examiner, that he always asked questions, and that as a rule they were quite creditably answered. This specialist seemed to think that as much was being done as was necessary to educate the student in venereal diseases, and was rather inclined to oppose my efforts to induce the medical schools to start special courses for their students. I could only reply by relating my experiences, which, I thought, entitled me to speak with greater authority than an examiner. In the course of six months in the early days of the war over seventy officers reported to me for duty in a large venereal hospital which I organised overseas. Many of these temporary officers were newly qualified, but it is no exaggeration to say that, with the exception of about half a dozen, none of them joined with any useful knowledge of venereal diseases. Nearly every one of them had to be trained in the work after joining before he could be trusted with the ordinary routine, and supervision of treatment was no sinecure. Since that time I have had the opportunity of teaching about four hundred practitioners, and have found in most of them the same lack of precise knowledge of the simple but important facts relating to venereal disease. For the most part, too, these were practitioners who were sufficiently interested in the subject to put themselves to considerable inconvenience in order to attend classes of instruction. One could not help feeling the pity of it, that in a post-graduate course one should have to confine oneself to the A B C of the subject. Again, in the course of my hospital work I have had many opportunities of judging this matter from the state of patients sent in for treatment or opinion, and from the letters which accompanied them.

To mention only a few of the important points in which I have found the practitioner's knowledge of venereal diseases defective, let me instance the diagnosis and treatment of syphilis. It has been known for some years that the earlier the diagnosis of syphilis is made and the treatment commenced, the better the outlook for the patient, and that if one waits for the Wassermann reaction to become positive the chances of obtaining a rapid cure are considerably diminished. It has also been known that there is nothing easier than the diagnosis of syphilis in its earliest stages: all that is required is a microscopical examination of the exudate from the sore under dark-ground illumination. This method is better than the naked eye, since it is available on the very first day the sore appears, long before it has assumed typical characteristics; it is better than the Wassermann test, because the Wassermann reaction cannot be expected to be positive until the sore is about fifteen days old, by which time valuable time has been lost. It is also known that the surest method of defeating the microscopical method of diagnosis is to apply an antiseptic to the sore beforehand. These are well-established facts, and facts, too, which one would say were not difficult to remember. Yet what usually happens? Out of some hundreds of primary sores which have been sent to my hospital for an opinion, I can hardly remember one instance in which request was made by the sender for a microscopical examination. Almost invariably the request is for a Wassermann test, and not infrequently the medical officer concerned has been treating the sore with antiseptics for a number of days, thus delaying the diagnosis and wasting most valuable time.

Again, one finds repeated evidence of ignorance in the use to which the Wassermann test is put in diagnosis. There is no more useful laboratory procedure than the Wassermann test, and no more reliable when it is properly carried out, but it does not dispense with the necessity of a clinical examination. Yet it seems almost as if the majority of practitioners now thought that it did, and had comfortably dismissed from their minds the necessity of remembering even the commoner clinical appearances of syphilis. Here, in spite of obviously syphilitic lesions syphilis is excluded because the Wassermann reaction is negative. There, every lesion which coincides with a positive Wassermann reaction is diagnosed as being itself syphilitic in nature, regardless of the fact that obviously it is possible for a syphilitic patient to suffer from other ailments than syphilis.

The appearances of even the commonest syphilitic rashes and lesions seem to be unknown, and I have met large numbers of instances where the patient has been under treatment for the most diverse complaints for weeks, all the time presenting signs of syphilis which it required only the most elementary training to recognise. I have thought sometimes that the practitioner concerned must have received a shock when he looked at last at the genitals of some of these patients. Such delay in diagnosis is neither fair to the patient nor to his neighbours, because the patient becomes thoroughly saturated with the disease, and his saliva and discharges are a constant danger to others from the point of view of accidental infection.

In regard to treatment, it is still common to see patients who have recently received only a few weeks' treatment by mercurial pills and then ceased, without any attempt having been made by the practitioner to impress on them the great importance of continuing treatment. It is commoner to find patients who have received one or two injections of "606" or similar compound and then been told that no further treatment is necessary. We hear on all hands of the carelessness of patients about the continuance of treatment after outward symptoms have disappeared, but I feel sure that there would be less of this if practitioners generally were not quite so vague about the minimum treatment and observation required by a syphilitic patient.

In short, I find that the average general practitioner possesses very little knowledge of syphilology that is precise and really useful. He may be able to deal with late syphilis—visceral gummata, tabes, and such-like wreckage, but he is vague as to the best methods of diagnosing and treating venereal diseases in the earliest stages, when so much more good could be done. His lack of precise knowledge contributes materially to the spread of venereal diseases. Directly so, because he fails to render his patients non-infectious; indirectly, because he fails to impress on his lay public the importance of applying early for advice and of abiding by that advice.

I have spoken chiefly about syphilis, but much the same could be said about the average treatment received by the sufferer from gonorrhœa. A small syringe and a bottle of lotion for local treatment, and some sandal-wood oil to be taken by the mouth, seem to be the routine, while simple disappearance of the discharge is considered sufficient evidence for the pronouncement of a cure.

The fact is that too many practitioners still look on venereal diseases as outside their province, and one cannot wonder that syphilis and gonorrhœa levy the toll on our national resources that they do.

A certain amount has been attempted towards the remedying of these defects in the education of the practitioner. The Local Government Board, in its regulations as to the conduct of venereal clinics, lays stress on the importance ef encouraging practitioners to attend the practice of those clinics. Some time ago the Panel Committee of London obtained the consent of the Director-General A.M.S. to my conducting post-graduate classes at Rochester Row, and nearly four hundred practitioners attended. Numbers of them travelled many miles across London to attend these classes, and the inconvenience to which they put themselves generally testifies to a growing desire for this kind of instruction.

Latterly, at the instance of the National Council for Combating Venereal Diseases, the Director-General A.M.S. has ordered that all newly-joined temporary medical officers shall spend ten days at Rochester Row, solely with the idea of the instruction which they receive there being useful to them when they return to civil practice. All this is so much to the good, but I do not think it is sufficient, in view of the importance of venereal diseases to the country. I hold strongly that the acquisition of a knowledge of the simple and important facts regarding the diagnosis and treatment of venereal diseases should not be left to the chance of a practitioner taking a post-graduate course, but be drilled into the student, and that he should be tested in his knowledge of the subject before his admission to the qualified ranks of the profession.

It will be granted that the medical curriculum should equip the student with a knowledge which is likely to make him of the greatest possible use to the community in matters relating to the prevention and cure of disease. Admittedly he cannot be equipped with a knowledge of all diseases, and those must be chosen which are most important to the health of the nation. How do venereal diseases stand in these respects? Do they, or are they likely to, affect a sufficiently large proportion of the population to justify their inclusion in the curriculum? Would their neglect have such a depressing effect on the efficiency of the nation as to cast a grave slur on those responsible for that neglect? Could they safely be left to specialists, as some suggest? I think that, on all these points, it is not difficult to make a strong case for the inclusion of venereal diseases in the curriculum.

Consider first the prevalence of venereal diseases. Before the war the Royal Commission estimated that syphilis affected not less than 10 per cent. of the urban population, and that gonorrhœa must be much more prevalent. Judging by the experience of other countries, one would say that this estimate was a very conservative one, and that gonorrhœa was about three times as prevalent as syphilis. I grant, of course, that before the war it would not have been hard to find in a day large numbers of practitioners who had hardly ever seen any venereal diseases, but that was no guide to the prevalence, because it is notorious that very many patients suffering from venereal diseases resort to quacks. A better test is to be found in the statistics as to the prevalence of children's complaints due to parents' venereal diseases and the mortality statistics relating to diseases which are directly or indirectly due to syphilis and gonorrhœa. I must refer you to the facts collected by the Royal Commission, which revealed the penalty we were paying even then for our neglect in these matters.

It is not, however, so much a question of prevalence in the past as of probable prevalence in the future. As to this, I believe that it is inevitable that we shall have a huge increase of venereal diseases when the war is over. At the present time there are a large number of infected women in the country. When the war is over and the Army demobilised the first effect of the reaction from its perils and hardships will be a very considerable increase of promiscuous sexual intercourse with these infected women. I would remind you that the responsibility for dealing with the resulting venereal diseases will fall on the civil community, for it will affect the *demobilised* army—civilians, that is, over whom the Army authorities will have no sort of control.

I need hardly dilate on the disastrous effects which widespread infection of the people with syphilis and gonorrhœa will have on the economic strength of the nation unless we insure that these diseases are efficiently treated. I would only remind you of the losses we should incur from abortions, still-births, early deaths, insanity of adolescents, and blindness, from disease conveyed to offspring—the loss of efficiency from the later effects, especially of syphilis, on adults, which is exemplified by the mortality statistics compiled by insurance societies and the facts as to the late effects of syphilis in over four thousand cases which were collected by Mattauschek and Pilcz. Besides all this, we have more insidious effects which may not be recognised as syphilitic in nature but are nevertheless due to the spirochæta pallida. The frequency with which pathological changes are found in the cerebro-spinal fluid in the secondary stage of syphilis gives ground for the belief that many more syphilitics must suffer from syphilitic arteritis of cerebral vessels than are recognised. Such arteritis must result in chronic cerebral anæmia and mental dulness. Only those cases where there is a definite breakdown are usually recognised, but the history of many of these—how they have been mentally dull for years—leads one to suppose that there must be large numbers of others who, without actually breaking down, are the worse intellectually for harbouring the spirochæta pallida. Further, I could give you numbers of instances to prove that the old syphilitic breaks down more easily under stress and strain than the normal person, and altogether the syphilitic is a person whose value to the nation has definitely depreciated from his acquisition of this disease. At a time when we shall require our man-power in its greatest strength of numbers and efficiency for the economic struggle which is before us when peace is declared, can we afford the depredations which venereal diseases will make on it unless we take adequate steps to deal with them? Are we, the medical profession, on whose shoulders rests the responsibility for taking those steps, to sit back, do nothing, and fail the nation in this matter? I trust not, when we could do so much, when we have in our hands the means which, properly applied, would save the population from the disastrous effects of these diseases.

In the first place, we have excellent grounds for believing that if antiseptics are applied at once to the contaminated parts, the gonococcus and the spirochæta pallida, both of them the most delicate of organisms, will be killed, and no infection result in the great majority of cases. We know also that gonorrhœa can be aborted after commencing if treatment is applied before the discharge has become purulent. In regard to syphilis, all statistics show that the most brilliant results are obtained in the group of cases where treatment commenced before the Wassermann reaction became positive, and that the smallest incidence of syphilis of the central nervous system and other *sequelæ* of syphilis occurs amongst the well-treated cases. Thus Mattauschek and Pilcz, in their analysis of syphilis cases watched for twenty years, showed that out of 851 indifferently-treated patients no less than 204 subsequently developed syphilis of the central nervous system; while out of 1139 which had been energetically treated only 83 developed these *sequelæ*. Wile and Elliot analysed 120 cases suffering from late syphilitic manifestations, and found that 50 per cent. had received no treatment at all, while all but one of the remainder had been treated indifferently. On the other hand, out of 40 well-treated cases watched for four years, only 4 had developed later manifestations.

The surest preventatives, then, of the disastrous effects of venereal diseases are immediate sterilisation in the first instance, and early and thorough treatment when this fails. For the universal application of these simple facts to the problem we require that the lay public shall appreciate them. The lay public must be taught that venereal diseases are a national matter, that a man who allows his venereal disease to run on is committing a crime against the State, and that no quack can abort either syphilis or gonorrhœa. There is only one person who can drive the lesson home, and that is the general practitioner. The specialist may impress a few and the set lecturer a few more, but the general practitioner comes intimately into contact with the lay public, and by casual remarks in the course of his routine work he can influence more than any of these. But he must know the subject; he must provide something better in the way of treatment and advice than the quack; he must be smart with his diagnosis and precise in his directions for treatment; otherwise he will effect very little. So long as general practitioners are vague on the subject of venereal diseases, so long will the public remain ignorant and careless.

I believe that the general practitioner should be in a position to make a microscopical examination when required and to administer the first treatment, whether it is for the abortion of gonorrhœa or the injection of a dose of neosalvarsan with a syringe. I do not think that venereal clinics would be able to cope with this part of the work to nearly the same purpose as the private practitioner. Speed in the application of the first treatment is of paramount importance, and if all cases converged to a clinic in the first instance, delay would be inevitable. Once the first blow has been struck the clinic can continue the attack.

Apart from all this, it is certain that in any case large numbers of patients will seek the advice of general practitioners, and it is of vital importance that these should be consistent in their advice; otherwise patients will lose confidence and discontinue treatment too soon.

I have attempted to show, then, that venereal diseases will inevitably affect a large section of the population; that unless they are properly treated they will have a perilously weakening effect on the efficiency of the nation; that we have in our hands the means of averting this great peril, and on our shoulders will rest the responsibility for any neglect to apply those means. I hope I have proved also that in this matter the first line of defence is the general practitioner, and that the responsibility for equipping him to bear his part in that defence rests with those who have in their care the education of the medical student. I think I have said enough to prove that venereal diseases must become an important subject in the curriculum of the medical student.

I should like to conclude by mentioning a few points which I think are important in the education of anyone in venereal diseases.

In the first place, familiarity with the microscope is all-important. The syphilologist who cannot use a microscope is terribly handicapped, because he loses valuable time in despatching and waiting for reports on his specimens. The atmosphere of mystery surrounding the microscope should be dissipated by thorough training in its use. After all, microscopy is only another form of inspection—simpler, surely, than percussion and auscultation. I should like to suggest that some practical instruction on the subject could with advantage be included in the physics course, and that some low-power dark-ground microscopy in the practical zoology course would add greatly to its interest. As to other subjects which bear on the treatment of venereal diseases, I hesitate to suggest, but it would help greatly if the chemist and pharmacologist were to direct some of their teaching to an understanding of the remedies used in the treatment of syphilis.

With regard to the special course in venereal diseases, I think this should be held throughout a winter session, and I am strongly of opinion that it should include some laboratory training. Students should be taught to take and examine specimens for themselves, and to make the most of poor sources of light in dark-ground microscopy. As to training in the Wassermann test, admittedly this is purely a laboratory procedure, but it helps the understanding of it if students are made to practise it, as I have found in my own classes. I think that about a dozen or fifteen lectures would suffice, but students should be drilled into the systematic examination of patients until no abnormality of the skin or mucous membrane escapes their notice. They should be trained in the technic of intravenous and other injections. I admit it is anxious work for the teacher, but it is a great thing to make a student realise that an intravenous injection is not such a terrible affair after all. Altogether, one would say that three teachers would be directly concerned in the training of students in venereal diseases—the pathologist, the syphilologist and dermatologist, and the genito-urinary surgeon.

Lastly, I think that the examination should be separate. For example, it should not be possible to make up for deficiencies in knowledge of venereal diseases by proficiency (on paper) in the art of performing a fore-quarter amputation.

XXXV.—THE TEACHING OF TUBERCULOSIS FOR UNDERGRADUATES.

By Professor Sir ROBERT PHILIP, M.D.

The *motif* for the teaching of tuberculosis to the undergraduate is to be found, on the one hand, in the extraordinarily large part played by tuberculosis in mortality and disease incidence, and, on the other, in the rapid advances which have recently been made in the knowledge of tuberculosis—pathological, epidemiological, clinical, and sociological.

The widening of outlook in relation to tuberculosis—as in relation to syphilis and cognate diseases—is one of the most remarkable of the present-day developments of medicine. Whatever shape the changes which are looming in the practice of medicine may finally take, it is abundantly evident that the practitioner of the future will have much closer relationship with the diagnosis and prevention and treatment of tuberculosis. If he is to be of effective value, his opportunities for study of the disease in all its aspects must be widened.

The medical outlook on tuberculosis has been completely changed. Official mortality statistics have been re-enforced by remarkable records testifying to the immensely frequent incidence of tuberculosis in one or other form. Reference may be made to the latest observations of the kind published by Reinhart (Berne) last October, who found that 96 per cent. of the bodies coming consecutively to post-mortem examination at the Berne Pathological Institution showed tuberculous lesions. Dividing them into cases which presented activity of the lesion and cases which showed more or less completely healed lesions, he states that 32 per cent. presented evidence of progressive tuberculosis within the system, while in the remaining 64 per cent. there was evidence of healed tuberculosis. Without labouring the point, it will be freely conceded that the record goes to prove the large part played by tuberculosis in the day-by-day work of the practitioner of medicine.

This is evidenced in similar, if less striking, fashion by statistics available in relation to our large hospitals. For some time back, by arrangement with the Managers of the Royal Infirmary and through the kind offices of the Registrar, I have had the facts regarding the incidence of tuberculosis in the various wards of that institution tabulated. The interesting result is that in the course of the past year some 650 cases were under treatment for recognised tuberculous lesions.

The following table illustrates the variety of tuberculous manifestation represented in the ordinary work of a general hospital. Had out-patient departments been included, the list would have been enormously greater.

Cases of Tuberculosis Discharged from the Royal Infirmary, Edinburgh, during the year from 1st *February* 1917 *to* 31*st January* 1918.

Cervical glands	196
Lungs and pleura	108
Brain (meningitis)	13
Spine	9
Abdomen	93
Kidney	9
Bladder	1
Testicle	10
Epididymis	3
Prostate	1
Vas deferens	1
Uterus	1
Salpingitis	4
Generalised tuberculosis	12
Abscesses	27
Sternum	4
Humerus	3
Wrist	10
Hand (dactylitis)	5
Axilla	8
Shoulder	6
Elbow	5
Hip	27
Trochanter	2
Femur	3
Knee and other joints	23
Leg	3
Tibia	2
Ankle	7
Foot	13
Nasal septum	1
Mastoid	1
Eye (keratitis)	4
Malar bone	1
Larynx	3
Middle ear	2
Maxilla	1
Skin	28
Total,	650

It is noteworthy that these facts relate to a general hospital which deals in chief part with adult cases. If reference be made to the incidence of tuberculosis in the *clientèle* of the Sick Children's Hospital, it is not too much to put the figure at approximately 50 per cent. of the whole.

As is well known, there has gradually developed during the past thirty years an increasing direction of effort, communal, national and international, towards the problem of tuberculosis. From 1911 to 1912 onwards in this country the subject has been more seriously dealt with by the State and a scheme of prevention and treatment has been recommended for adoption throughout the country. A special tuberculosis service has been projected, including tuberculosis officers of various grades. When the need for such officers was admitted and their appointment approved, it was clearly recognised that the national anti-tuberculosis scheme would be successful in proportion as the general practitioners throughout the country had their attention and interest awakened in the matter.

The Departmental Committee on Tuberculosis recommended (Interim Report, p. 27) "that special regard should be given to securing the co-operation of medical practitioners in the working of the tuberculosis schemes, particularly in relation to the early detection of the disease and its domiciliary and dispensary treatment."

And in the Final Report (p. 16) the Committee advised as follows :—

" *Medical Education.*

"The Committee are of opinion that additional facilities should be afforded to medical students and practitioners to acquire familiarity with the methods of diagnosis of tuberculosis, more especially in its earlier manifestations and with the methods of treatment. They desire, therefore, to make the following recommendations :—

"1. Medical students and practitioners should be afforded facilities to attend the practice at tuberculosis dispensaries, sanatoria, and other institutions.

"2. It is advisable that tuberculosis dispensaries should, where possible, be directly associated with schools of medicine."

During the five years that have elapsed since the Departmental Committee issued a Final Report, their recommendations regarding methods for the prevention and treatment of tuberculosis have been generally accepted and action on a large scale has followed throughout the Kingdom on the lines proposed. Similar developments are in progress throughout the Empire. These have necessarily been interfered with considerably by the war, but the machinery has been created for work on large and well-defined lines, when circumstances will allow.

Soon after the issue of the Departmental Committee's Report, the attention of the late Principal Sir William Turner was drawn to the matter and to the facilities which existed in Edinburgh for the teaching of the subject. He took the view that steps should be taken by the University towards implementing the recommendations of the Departmental Committee. The foundation of a Chair in the University was the result.

With a view to the training of students, special care was taken, at the time of the amalgamation of the Tuberculosis Institutions of Edinburgh, that the Agreement between the Corporation and the Committee of Management of the Royal Victoria Hospital should be framed so as to safeguard all the privileges attaching to the several institutions in the interest of students of the University of Edinburgh.

Clause fifth of the Agreement reads as follows:—"In respect that the Royal Victoria Hospital, Tuberculosis Dispensary and Farm Colony have in the past afforded to students of medicine unique facilities for the study of tuberculosis, the second parties (*i.e.* the Corporation) shall, in the event of the University of Edinburgh establishing a chair or lectureship in relation to tuberculosis, give all reasonable facilities, under regulations to be made by them from time to time, for the purpose of the teaching of such chair or lectureship in connection with the work carried on by the second parties in the said Hospital, Dispensary and Farm Colony, and for the purposes of research."

The Agreement, embodying the above stipulation, was subsequently ratified by Act of Parliament.

The foundation of the Chair stereotypes the recognition by the University of the place tuberculosis occupies in the everyday work of the medical practitioner and in the large field of preventive medicine. The subsequent resolution by the University that the Class of Tuberculosis should be included in the Regulations among the classes qualifying for graduation has further consolidated the position.

The question whether undergraduates are at present adequately equipped for the recognition and treatment of tuberculosis is uncompromisingly answered by the reply made to me by a tuberculosis officer with whom I happened recently to discuss the matter. His response to my question as to how much he had learned of tuberculosis during his medical curriculum at one of the English universities was, "just as much as I did of shipbuilding!"

Putting aside the poetic setting, I am satisfied that, with our present outlook on tuberculosis, his answer is substantially correct. The horizon of the student requires to be widened in respect of the part he will find tuberculosis play in his work from day to day. This can only be effected in a course which includes a consideration of the different aspects of tuberculosis—pathological, clinical, and preventive.

The attention of the student must be diverted from the *last* stage of tuberculous disease, whether in the form of advanced pulmonary, genito-urinary, abdominal or other tuberculosis, to its completer consideration as an infective disease. Starting from the initial infection, he must be trained to think of the earliest clinical and pathological manifestations and the possibilities which await the patient if these are not checked. His earliest object-lesson should be the guinea-pig with its local sore at the point of inoculation and the gradual spread through the various groups of lymphatic glands to the finished picture when the different viscera are involved. His thought regarding the occurrence of tuberculosis in the human subject and its further developments must be guided along exact scientific lines. He must be trained to recognise the varying indications of localised disease according to the date and course of the spread and likewise the evidence of systemic intoxication. Both on the pathological and on the clinical side, the course must be richly illustrated and made as practical as possible.

A few examples may be cited under the several heads :—

1. *Pathological.*—The course will comprise a study of the life-history of the tubercle bacillus, the methods of its culture and its relationship to other organisms. The student will be taught the best methods for the detection of the tubercle bacillus in discharges, secretions, etc. The various concentration methods, notably the anti-formin method, will be practised in connection with staining procedure and making of cultures direct from sputum. The course will similarly include the revised study of pathological specimens in relation to clinical facts and a consideration of the pathological principles underlying the preparation and use of tuberculin and the meaning and value of blood-tests.

2. *Clinical.*—This will be as practical as possible. The endeavour must be to illustrate the clinical manifestations of tuberculosis in the widest sense. The various methods of diagnosis will be rehearsed and refined. The advances and adaptations of physical diagnosis will be studied, including X-ray examination. The value and uses of tuberculin in diagnosis and treatment will be demonstrated practically. The principles underlying prognosis and the factors which guide its determination will be discussed in relation to cases undergoing treatment.

Opportunity will be given for observing sanatorium methods in operation, with especial reference to aerotherapy, a fixed regimen and dietary, rest and movement, skin hygiene, etc. In relation to treatment, the progressive changes observable from week to week will be illustrated as far as possible by showing patients undergoing treatment at successive stages. In this way the immediate effects of tuberculin therapy, general and local, the progressive effects, the selection of cases for tuberculin therapy, the methods of its use and the principles of dosage, will be studied. At the same time the possibilities of chemotherapy will be considered and the significance and value of drugs and operative lines of treatment.

3. *Preventive.*—Etiological factors will be considered, including the different aspects of environment and milk supply. Opportunities will be given for the observation of preventive methods at the various

institutions concerned with this part of the work, including the Tuberculosis Dispensary. The purpose and methods of the Tuberculosis Dispensary as a centre for receiving and handling the varying types of tuberculous disease will be studied and its functions as a centre from which there passes to the homes of the community a practical knowledge of the principles of prevention through the visits of officers and nurses.

It will be a leading aim of the course to enforce the principle embodied in the Tuberculosis Dispensary, namely, that the protean manifestations of tuberculosis are the varying resultant of a common cause acting under varying conditions calling for separate consideration, that, if prevention and treatment are to be worthy of the name, tuberculosis must be *sought for* in the household and in the community, and that it cannot be regarded as sufficient to wait until tuberculosis presents itself at a stage when refinement of diagnosis is unnecessary and treatment largely futile. The methods and results of the "march-past" of households and the measures for the correction of faulty environment and nutrition are subjects of first moment. Attention will also be paid to the need for correlation and co-ordination of the different elements in an efficient anti-tuberculosis scheme.

As to the *place of the course in the curriculum*, it seems feasible that the subject should be dealt with in a course of, say, twenty to thirty meetings which should be largely practical. It is desirable that the course should be attended by senior students who have for the most part completed their training in clinical medicine and surgery.

XXXVI.—TEACHING OF INFECTIOUS DISEASES.

By CLAUDE B. KER, M.D., F.R.C.P.(Edin.).

It does not appear necessary to say very much on the question of the teaching of infectious diseases. This is not because the subject is not an important one; on the contrary, as I am in the habit of telling my students, it has one claim to importance which is not shared by any other subject in the curriculum. When a man makes a bad mistake in medicine, surgery, or, let us say, ophthalmology, the results of that mistake are purely a matter between him and his patient. The latter may die or be left crippled, the former may be liable for malpraxis, but that is all. But if he makes a mistake in the diagnosis of an infectious disease he may quite easily be responsible for the origin of an outbreak which may be extensive and fatal. It is undoubtedly the fact that many smallpox outbreaks are directly due to the original case being regarded as chickenpox, and even a small outbreak of smallpox is extremely expensive to the community concerned. As regards infectious diseases, then, we have, besides the medical attendant and the patient, to consider a third factor—the general public.

It was to protect the general public, in fact, that the General Medical Council made compulsory a class which up to that time had not received academic recognition. The regulation demands twelve attendances in the wards of a fever hospital, and I am inclined to think that this is all that can be reasonably expected from the student. It is obvious that a few more meetings would be of great value, but the same could be said of any clinical course. What we have to remember is that each of these twelve hours means nearly two and a half hours of students' time owing to the distance of the hospital from the university, a difficulty which applies to other medical centres also. In these circumstances it would be far from easy to fit in extra hours.

The suggestion has been made that the course should be systematic as well as clinical, and that the Professor of Medicine should drop the subject from his lectures. I cannot see that such a change would be of any advantage to the student who gets excellent instruction on fevers in the Course of Medicine under the present arrangement. Any change would probably result in his being lectured for twelve or fifteen more hours than he is at present, as it is not to be expected that the lectures on medicine will be reduced by that amount.

The student at present is advised to attend the course in his fourth year. I think he should come as late as he can, but attendance in the summer session has many advantages, and his last summer session is, in most instances, a year before he qualifies. The fact that the class of medicine is now held early in the course has removed the anomaly which used to exist, that men sometimes attended fevers before knowing anything at all of general medicine. It is very necessary also, from my point of view, that the student should have read either the notes on infectious diseases which he has taken in the class of medicine, or some short text-book on the subject, before attending the clinics.

The clinics are mainly devoted to diagnosis and management. My main object is to show as much as possible on each occasion that the men attend. It is for this reason that it is so important that they should come with some knowledge of the subject, as otherwise the variety of the demonstrations might be a little confusing. There is very little time for discussion or explanation if many cases in several different wards have to be demonstrated, but if a man has a fair idea of the general course of a disease and of its more important complications he is able to appreciate the main points presented by the different cases which are shown to him.

It would be a great advantage if the number of students attending a clinic were less. Before the war about eight sections of thirty men each used to attend annually and one section of women. The repetition involved in the teaching of the same facts nine times in the year is very trying to the lecturer. Otherwise a limitation of the numbers to fifteen men per section would be an improvement. As it is, a certain amount of effort is required to make sure that everyone can see what is demonstrated. I pride myself on the fact that if a student does not see any particular thing it is entirely his own fault, as, generally speaking, the rashes are easy to see, and as a rule only good ones are demonstrated. I regret, however, there is always some hanging back on the part of the students, some men being very shy about approaching a bed closely. In a way this is natural, especially if an examination is impending, as an attack of infectious disease may be extremely inconvenient. As a matter of fact the students very seldom take any infection; I have not seen ten cases in twenty years, and I am afraid to say how many men have attended the hospital in that time. If a disease is taken it is usually chickenpox or measles.

The clinical material in a fever hospital varies very much even from day to day. Rashes are very evanescent and are not often useful for clinic purposes for more than two days. The exudation on a diphtheritic throat also tends to disappear quickly. There must always be an element of luck in what each section of the class sees. Some sections appear to be much more fortunate than others, but on the whole the average student sees quite enough. The summer term, during which most men take out the class, usually affords a good supply of infectious diseases and perhaps more variety than the other two terms. In this term, moreover, the class is held in daylight, which is by no means always the case in autumn or spring, when more than half the clinics are held in artificial light—a difficulty it is impossible to get over, as students cannot get out before 3.45 P.M. The average student sees a lot of scarlet fever, diphtheria and measles, a sufficient amount of erysipelas and cerebro-spinal meningitis, and always one or two cases of enteric fever which are carefully studied. He is also sure of seeing chickenpox, a disease to which I pay great attention in the clinics on account of its value in emphasising the possibilities of missing a case of smallpox. I have always held that chickenpox is insufficiently studied. If its peculiarities are once understood and appreciated the chances of confusing it with smallpox becomes much more remote. We cannot, unfortunately, show smallpox to every student, but we can insure that the disease which resembles it most closely is thoroughly taught.

In addition to these diseases the student is unlucky if he does not see a few examples of mumps, rubella, and whooping-cough. The two latter are usually epidemic in the summer term and are at that season very frequently demonstrated. Every opportunity is, of course, taken to show all important complications which occur in hospital during the period of attendance.

Dr. Fowler at the last meeting of the Club raised the question of the seasonal incidence of disease in children. At the Fever Hospital we are bound to suffer even more in that respect. But I do not think that any practical arrangement could be made to spread the attendances of students over the whole year instead of over three months. It must be remembered, in the first place, that I can never guarantee that on any single day there will be a demonstrable example of the rash of a particular disease, and if, for instance, there were three attendances in the autumn term, it is quite possible that one or more of these days would be blank days as regards the particular disease which attendance at that time of the year was expected to secure. Again, the difficulty of arranging the attendances at long intervals of 250 students might well prove insuperable, and in any case the continuity of instruction gained by regular weekly attendance for three months would be lost without any compensatory advantage.

On the whole, then, I am inclined to hold the view that the instruction given and the opportunities for seeing infectious diseases, under the present arrangements, are reasonably adequate, and that, considering the distance of the hospital from the school, it is impossible to exact more time from the student.

XXXVII.—THE TEACHING OF SURGICAL TUBERCULOSIS.

By JOHN FRASER, F.R.C.S.

One has first to define what one means by the term surgical tuberculosis, and I take it that one may define it as tuberculous disease of the bones, joints, and glands. In introducing the student to these conditions, I believe that the instruction given ought to be largely clinical. A few pathological and lantern demonstrations are essential in order to illustrate to him the pathology of the disease.

Surgical tuberculosis, of course, occupies a considerable portion of the work of a children's hospital, and while in attendance there, the student sees a very large number of cases.

We introduce the subject to him by reminding him of the etiology, and we make every effort to impress upon him the importance of milk as a source of infection. We teach him, as far as we can, the diagnosis of surgical tuberculosis, more especially the diagnosis of tuberculous joints, in which early diagnosis is so important for successful treatment.

A demonstration of X-ray material is arranged, for we find that a very real difficulty which the student has is the reading of an X-ray plate so as to detect the presence of early bone or joint tuberculosis.

In regard to treatment we impress upon him the importance of conservative treatment. We try to illustrate to him the peculiarities of the case in which open operation is best. We give him as complete instruction as we can in the variety of splints which are in use for tuberculosis of the bones and joints.

Such, briefly, is the outline of the scheme which we aim at, but bearing in mind the fact that nine-tenths of our audience will follow general practice, we make it our aim that whatever he has been taught he at least has had instruction, firstly, in the diagnosis of surgical tuberculosis; secondly, in recognising when open operation becomes absolutely necessary; and thirdly, the enormous importance of conservatism as a means of treatment, and I believe that, from the general practitioner's point of view, these are the three essentials of his work as far as surgical tuberculosis is concerned.

We make a point of demonstrating to him a large number of cases representative of every form of the disease, and unfortunately we have no lack of material.

We have found it difficult to advise the student in the use of tuberculin. Our own experience has been disappointing and general opinion on the subject is still very unformed, but we illustrate to him the uses of tuberculin, and we certainly impress him with the fact of its being a very dangerous weapon when used in unskilful hands.

DISCUSSION.

Dr. Norman Walker.—It has struck me as a very interesting feature of these discussions that we have shown at almost all of them the same appreciation of the possibility that we may have been wrong in the past—that our methods were not necessarily perfect. And so now with venereal diseases. It is not so very long ago since inquiries about this were started, and several members of the Club may remember the somewhat complacent satisfaction with which we reported that the teaching of venereal diseases was hardly improvable. We have now come to the conclusion that that is not so—which is the first step to a happier state of things.

The first thing I have noted in connection with Colonel Harrison's paper is the *examination.* The proposition of setting up such an examination in venereal diseases, that a man might possibly be rejected in his final because of it, is one which will not meet with universal assent. I speak from the point of view of a teacher of a subject in which an examination used to take place, but has now been done away with, when I say that I think better than any special examination is the system now in vogue, viz. that the teachers of the special subjects are required to note the student's attendances—to this taking of attendances I attach the utmost importance—to record the work done with him in the cliniques, and to certify as to his reasonable capacity.

Colonel Harrison referred on more than one occasion to the skin. Although, personally, I have no wish to add the teaching of venereal diseases to that of the skin, I am convinced that it is right that the students should be taught the rashes, which are *the* things which are brought to their notice first; for the patient does not, as a rule, expose local lesions. He comes to the doctor hoping that the rash he has is not syphilis, or that, if it is, the doctor will be too polite to say so, and will cure him somehow without asking too many questions. A patient with syphilis may have other diseases, and one constantly sees cases of psoriasis which have been treated as syphilis.

Questions as to the prevalence of venereal disease were asked in our earlier inquiries, and from every quarter there came the answer from general practitioners that they had been for many years in practice and had very rarely seen a case. But the truth is that people go to quacks and chemists, who treat them very inefficiently, and so the evil goes on. One hopes that our efforts in this matter in Edinburgh may help to put suitable legislation into force before very long.

In listening to these various debates, one has been impressed by the fact that everything points to an extension of the curriculum. The five years is little enough, although there are, I know, universities which cut that five years down to fifty-seven months—the shortest permissible period. It would be an improvement if the examinations were clear of the sessions. In his last term the student is almost entirely taken up with examinations, and if this could be changed his last three months would be much more useful to him.

I was interested in Colonel Harrison's remarks about the cliniques for practitioners and the class which had attended them. Surely such cliniques could be combined with some instruction for senior students, with great benefit both to practitioners and students. That involves this question, viz. that we in Edinburgh are too much held down by the tradition of the hospital hour. Teaching there, except for the tutorial classes at night, is practically confined to the hours between eleven and two. Would some of us not be prepared to give some of our afternoons to this?

Dr. Fleming.—In medicine we are apt to neglect the great importance of syphilis. Speaking as a former pathologist, I am certain that the amount of disease directly due to syphilis is very great. I was struck with Colonel Harrison's remarks on the loss to the community of good thinkers and workers due to improperly treated syphilis, which, though not leaving the patient actively ill, yet impaired his intellect and energies.

Dr. Veitch said that he had seen a fair amount of venereal disease in general practice, but it was seldom that civil patients reported sick to their doctors in the early stages of the disease. This handicaps the practitioner both in diagnosis and in treatment.

Mr. Miles.—Colonel Harrison has convinced us on both sides of his paper, as regards the disease itself and its importance and prevalence, and, what we are perhaps more particularly interested in here to-night, the methods of teaching it.

Within the last ten years the charge of the lock wards in Edinburgh has been taken by junior surgeons in rotation, with great benefit to themselves and to the teaching. We look forward now to increased improvements in this department. The Report of the Royal Commission and the action taken by the Local Government Board on the head of it is going to give us a really well-equipped department and proper means of teaching the subject.

I was glad of Dr. Walker's lead touching the co-ordination of the teaching of dermatology with the teaching of syphilology. We have all through these discussions tried to arrive at some means of co-ordinating the different subjects, and he has thrown out a useful hint in regard to these two subjects.

We have an arrangement in this school for issuing a certificate in venereal diseases to students. I understand that every student must present to the Dean a certificate of having attended the course, of having carried out certain investigations of a microscopic kind, and of having given a salvarsan injection, and that, unless he has this certificate, when he qualifies he is not entitled to draw from the Local Government Board supplies of salvarsan and its substitutes free of charge. I think I am right in saying this, but in any case that is a proposal which is to be put into force when the department is established.

Mr. Muir.—Can Colonel Harrison recommend any practical histological method other than the one he mentions, such as the Burri, Levaditi, or Giemsa methods? Because in the first place it is extremely difficult to demonstrate these secretions with the dark-ground method to such large classes as we have to deal with. Again, I quite agree that this method is to be recommended where the investigator can get the fresh secretion from the patient and prepare it for this method; but what about the general practitioner, who may not have the necessary outfit, which costs from £20 to £50? I am certain he would prefer to send such material to a laboratory for report. This, however, can only be done by forwarding microscopical films in the usual way, which are of course unsuitable for the dark-ground method. I think it is important to meet such conditions by some other histological method.

Dr. Clarkson.—I am afraid a great deal of what Colonel Harrison said about general practitioners is true. It is most unfortunate that men who have graduated recently and who have had an amount of training in microscopical work which never fell to our share, never look down a microscope after qualifying and are incapable of staining anything. They find they can get along without it, so take no trouble over it. General practitioners do not see syphilis in the early stages. I was in practice for about twenty years and I saw very little venereal disease: and when I did see it, it was generally in the form of a still-born baby or a well-marked rash. I did not see a primary sore half a dozen times. Nowadays there is a big change in the feeling of the public in this matter. The trend of the times—as evidenced in Brieux's play, *Damaged Goods*—is to awaken their minds to a consideration of the subject and to educate them as to its importance.

Dr. J. S. Fraser asked Colonel Harrison how he would propose to teach venereal disease, especially syphilis, as affecting the special subjects? Should syphilitic affections of the ear, for example, be taught by the ear specialist, or be included in the course on venereal diseases?

Dr. James Miller.—The whole question of microscopic diagnosis comes under the department of pathology and bacteriology. So far as I know, nothing in the nature of this teaching is carried out at present in the venereal course. One thing in which the students do require a great deal of drilling is the method of taking specimens and in interpreting reports.

Sir Robert Philip.—Apart altogether from the Royal Commission and the governmental action immediately following it, we must realise the large part Colonel Harrison himself has played in forcing this question. There is no doubt that it is to Rochester Row that we owe many of the practical developments which are now ensuing. I would like to ask Colonel Harrison to tell us how he runs his course from day to day and from hour to hour—how, if we were a class assembled for the first time, he would propose to lead us through the mazes of his subject.

Professor Lorrain Smith.—I, too, was going to ask Colonel Harrison this. In his paper Colonel Harrison mentions a student attending a course during the winter, and as we have to include in our report practical suggestions as to the teaching of students, I would like to ask Colonel Harrison to go into details as Sir Robert Philip suggests; to tell us the hours and the relative amount of practical laboratory, clinical, and lecture work which the student should be expected to overtake to equip him for the certificate which we propose to grant in this school.

Dr. Traquair.—One of the most important points Colonel Harrison made is, I think, that the public must be educated to regard venereal diseases from a new point of view. This change of attitude can only be brought about by educating the general practitioner, which, again, can only be done by educating the student. In respect to this, I remember a remark made to me by Sir Robert Philip some time ago regarding the attitude of students towards syphilis. In writing up a case they will say the patient *denies* having had venereal disease. That attitude will have to be done away with before any progress can be made. As long as students and practitioners, and, through them, the general public, are allowed to regard venereal diseases in this way, efficient treatment will be hindered. In the train of this new attitude will come, it is to be hoped, truthfulness of death certificates. Sir William Osler has pointed out the enormous importance of syphilis as a cause of death and the trifling exposure of that importance which is made in the returns of the Registrar-General in Edinburgh.

The amount of syphilis which appears in the Eye Department of the Infirmary seems to me to be relatively very great. I have seen five cases of syphilis in one morning in one ordinary out-patient clinique. I have noticed that students frequently do not seem to be able to recognise an obviously syphilitic individual at a glance—which brings me to the question of examination. It seems to me that, while an examination may be bad if wrongly conducted, surely we should ensure that before a student is registered and sent out to practise amongst the public he should at least have a knowledge of some essentials. It might be stated clearly in a syllabus or otherwise that students will be expected to realise the importance of the diagnosis of syphilis and the importance of its continued treatment. One often sees, in the Eye Department at any rate, that while the disease may be recognised, the importance of *continued* treatment is far from realised; for this the teaching must be largely to blame. There seems to be something radically wrong about the teaching, at least in regard to the results.

Colonel Harrison said in reply.—I should like first to express my great appreciation of the sympathy you have shown with this subject, which I have very much at heart. I came rather expecting to have something to fight, but I find there is very little of the combatant element here to-night.

Dr. Walker rather doubted the use of an examination. I grant that an examination is not everything, but my experience is that the unwilling student may be made keen by the spur of it. I remember in the years before the war—1910-1914—that when we were training R.A.M.C. officers—so-called senior captains—for their promotion course, of those who took up venereal diseases, the majority took it up solely because they felt no inclination to devote themselves to any other subject. It was the spur of the examination at the end of the course which alone kept them to it, so that at last they became thoroughly interested in what they were doing.

With regard to the difficulty of getting the public to report early. That, I think, is probably only a matter of education. We experienced this with the troops quartered in the London district before the war. We set ourselves to educate them as to the value of *early* treatment; and gradually, without any application of the Army Act, we reduced the number of men reporting as late as the secondary stage and increased the number of those reporting in the primary stage, with the result that whereas in about 1910 for one reporting in the primary stage we got two reporting in the late secondary, just before the war we had two primaries reporting to one secondary. I think if practitioners generally were to demonstrate in the same way that it *is* worth while to report early, the movement would spread amongst the general public.

Captain Millar answered Mr. Muir's question in regard to dark-ground illumination and staining as I would answer it. Staining is not to be compared with the dark-ground method. By it we see the living spirochæte: in a well-lit, dark-ground specimen the graduation in lighting of a spirochæte pallida in comparison with others which may resemble it very closely can most usefully be observed. The other methods are, I think, very liable to lead to errors in diagnosis.

I am asked to go into details as to my course on venereal diseases, which, of course, brings up the question of the relation of the eye and the ear specialist to the venereal specialist. It would help enormously if the eye or ear specialist, recognising a case of syphilitic disease of the eye or the ear, would at once send it to the venereal specialist for demonstration to his students. As regards the details of the course. This is rather a difficult question for me, because I have been more or less living from hand to mouth. I have had to hold courses which I have felt were not nearly so complete as I should have liked; but the line which I go on is this. When the newly-joined class comes to me I start by telling them that I am going to teach them microscopic methods first of all, and I impress upon them not to be afraid of using the microscopes that they will find in every department of the hospital. I urge them to take as many specimens as possible, and to remember that those who are there to instruct are only too glad to do it. As a preliminary to the microscopic work we give them a demonstration on the principles of dark-ground microscopy. So far the work has occupied two or three days. The main part of the teaching is clinical. Some days are spent in the syphilis department, where the teacher sits down and goes through the case systematically from top to toe. We teach the student that he *must* examine every venereal case from top to toe. I refuse absolutely to see a venereal case until he is exposed sufficiently for me to see him in that way. I admit, of course, that with women we could not do this. I like the classes to be rather small. I do not like more than half a dozen round one teacher. As we go along, the students are taking specimens of syphilis and gonorrhœa. With regard to the teaching of the laboratory work more particularly, I think it is of value to the men to learn a little about the maximum of hæmolysis, what complement is, and so on. After about half a dozen or ten sittings in the laboratory they should learn all they need know in order to understand the terms which the pathologist uses. I lay great stress on the interpretation of laboratory reports; this can be done largely in one lecture. Speaking of lectures, I find that twelve or fifteen during the course suffice. The first one, which I give myself, is a complete demonstration of the method of examining a patient (this is emphasised again in the clinical department) and a demonstration in the simple methods of taking specimens. The next lecture is on the interpretation of laboratory reports; what should be done under different circumstances, *e.g.* when the pathologist reports that he has not found spirochætes, when he says that he has found diplococci, which are morphologically indistinguishable from the gonococcus, and so on. Then we start on the treatment of syphilis: we consider each remedy in turn, its side effects and how to combat them, and its general place in the therapy of syphilis, building the whole into a complete course for different periods of syphilis and how the disease is to be modified. This, I think, should occupy perhaps five or six lectures. Next we come to soft chancre and such minor things as balanitis; and finally one ends up with gonorrhœa. Here I aim not at teaching the finer things so much as at giving the men the principles, laying down for them set methods of early treatment and abortion of gonorrhœa. I finish up by impressing upon them what a very difficult thing it is to treat developed venereal disease and what a simple thing it is to abort it. As far as the university course is concerned, I do not see how the venereal course can be fitted in without it dragging through a winter session. As regards the clinical part, I would set students down definitely to examine cases and draw up a complete diagnosis. Then I would myself examine the case and criticise the notes and findings. I think the student will learn far better by being made to take his own notes. Lastly, in the course which I hold at Rochester Row, every Tuesday evening I get the medical officers in that hospital to meet together to discuss their interesting cases, and I get everybody who is attending for instruction to come and listen and learn.

XXXVIII.—THE SCHOOL EDUCATION OF GIRL CANDIDATES FOR THE PROFESSION OF MEDICINE.

By MISS BENTINCK SMITH, St. Leonards, St. Andrews.

I TAKE it that the task you have set me this evening is to give you my views as to the best education at school for girls who intend to take up medicine as a profession.

The question may seem to resolve itself into two alternatives: Shall a girl specialise at school with a view to taking up medicine, or, in other words, shall her education be primarily scientific? or shall the girl, who is in the future to be a doctor, not specialise in science any more than in any other subject, *i.e.* shall her education be of the more or less usual literary type, whether on traditional or modern lines, with the admixture of elementary science, which I suppose we here are all agreed in considering essential in any course of study that claims to be educational at all? I am excluding for the purpose of this discussion elementary education up to the age of, say, thirteen.

My task would be simple if the answer to either of these alternatives could be Yes or No; but, in my opinion, that is not possible. The woman doctor is after all a woman first and a doctor afterwards, and if we are to turn out good women doctors we have first of all to secure good women, *i.e.* competent, fully developed human beings equipped with the qualities we consider characteristically desirable in a woman as an individual and as a member of society; and, secondly (but only in the second place), we have to train these women in the art of the practice of medicine. To act otherwise would be to imply that the professional training for medicine was in itself the best educational training, taking education in its widest sense. But I doubt that any even of the present audience, which, I suppose, is largely medical and scientific, would go that length.

Professional education, so-called vocational training, is, in my opinion, out of place at school, and early specialisation with a view to rapid and early success in a profession will defeat its own end, no matter what the profession may be, but it will be specially disastrous in medicine. Up to the age of sixteen the education of the girl who aspires to medicine should not differ from that of any other girl. Both should study at least a modicum of the exact sciences—mathematics, elementary physics, and chemistry—but both should also have a fair chance of becoming familiar with more than one literature, which means more than one language in addition to their own. Both should get some knowledge of history and of the historic method, and both should be practised in the power of self-expression, whether in letters, in music, in art in the narrower sense, or in movement, say, games or dancing. In short, a human being to be called educated must have been taught to think and to appreciate thought, and be, or have become, accessible to æsthetic emotions, and capable of a certain degree of creative activity by means of the practice of some art. If that be true of human beings in general, it must, since the greater includes the less, be also true of the would-be doctor. Too early a devotion to specialised knowledge must limit the time that can be spared for general education, for not even a modern time-table can hold every subject. After sixteen it may be, and often is, possible to specialise in school to a certain extent, and a girl who has a strong bent for science may safely devote, and should be given a chance of devoting, one-third to one-half of her working time to science, but not more. On the other hand, a girl who is destined to read for honours in classics or history should equally devote some portion of her time to science.

The point I want to make is this. It is all-important in the interests of women and of the medical profession that only the well-educated woman should aspire to medicine. If you devote too much of a girl's time at school to the acquisition of scientific information, even if it be acquired by the most up-to-date experimental methods, you limit the chances of wider cultivation, and, personally, I would rather a girl plunged comparatively ignorant of science into the study of medicine than comparatively uneducated in the wider sense.

Several very obvious objections will be made to this statement. First, that time is a matter of great importance, for, literally, time means money, and if a girl who wants to take up medicine leaves school without a specialised knowledge in certain departments of science, she will have to add a year to her professional studies in order to atone for her scientific ignorance — a serious drawback in the case of poorer students ; secondly, that at the medical schools and at the universities examinations for scholarships and bursaries presuppose a considerable amount of specialisation in science, and the girl educated on the lines I am assuming would therefore be debarred from these benefits ; thirdly, a point to be resented by the true scientist, my argument may be held to deny the educational value of science.

I agree that the question of time and money constitutes a real difficulty, but one that ought to be met by the willingness of university examination authorities to value evidence of intellectual promise above information, and general, above specialised, knowledge. The present standard of University Entrance Scholarship papers puts a premium on cram at school—even science can be crammed—and induces in the aspirant to a scholarship a state of mind which we familiarly, and not inaptly, call "staleness." Schools, especially girls' schools, have, I know, tried to put pressure on the universities and colleges to alter their methods for the award of scholarships—so far without success. The question of money ought not, however, to be allowed to exercise an adverse influence on education, and perhaps as the nation, including educational authorities, becomes more enlightened it will cease to do so.

I am armed against attack on the third point by the Report of the Committee on the Position of Natural Science in Education, which you have all probably read with much interest and profit. Even the signatories to that Report, who may be taken to represent the most advanced scientific opinions in the country, do not claim more than a modicum of a pupil's time for science, rightly recognising that in a truly liberal education science must share the honour of a place with other subjects. "Some of the advocates of scientific training"—I quote from the Report—"have damaged their cause by claiming too much for their subject, and by seeming to depreciate the value of the literary studies which had tended to monopolise the attention of the ablest pupil. . . . We do not think that the surest method of victory is to be found in the overstatement of the merits of science, or the depreciation of the value of classics. . . . We are confident that the teaching of science must be vivified by a development of its human interest side by side with its material and mechanical aspects, and that while it should be valued as the bringer of prosperity and power to the individual or the nation, it must never be divorced from those literary and historical studies which touch most naturally the heart and the hopes of mankind." Nobody here doubts the educational value of a study of science. We are agreed, to quote once more from the Report, that: "It can arouse and satisfy the element of wonder in our nature. That as an intellectual exercise it disciplines our powers of mind. . . . That it quickens and cultivates directly the faculty of observation. That it teaches the learner to reason from facts which come under his own notice. That by it the power of rapid and accurate generalisation is strengthened. That without it there is a real danger of the mental habit of method and arrangement never being acquired. . . . That in the science lessons the eye and the judgment are always being called upon for an effort, and because the result is within the vision and appreciation of the learner, he is encouraged as he seldom can be when he is dealing with literature. . . ." All this we may grant, and yet I repeat that if a girl who aspires to medicine has, in her school career, to choose between a liberal education in which, for various reasons, science can play little or no part, and one which, in spite of the opportunities offered for the acquisition of a considerable amount of scientific knowledge, is less liberal, she will be well advised to choose the former. She can make up for lack of early scientific training, but she can probably never make up for lack of early literary and æsthetic training. Luckily, in an increasing number of cases, girls are not confronted with this Hobson's choice, and most of the schools from which the women doctors of the future will be recruited provide normally for the study of English, including history and geography, languages other than English, mathematics, and natural science, and each of these subjects is considered an integral part of a girl's education.

If we were living in Utopia, I would like to emphasise two other points.

The first is this: In most trades or professions in which women, rather recently, have entered into serious competition with men, it is a fact that in order to establish her claim to equality of opportunity and treatment with men the woman has, in the first instance, had to prove her superiority. In many cases we have resented this necessity as weighing unfairly on the woman. In the interests of the medical profession and of the individual woman doctor, I hope the necessity for relative superiority in the woman will survive. My great anxiety at the moment is lest too many intellectually and morally mediocre women should crowd into medicine. The large number of well-paid medical posts that have of late sprung up, the scarcity of men doctors, the social limitations in other professions open to women, such as teaching, are all contributing causes to a growth in the number of women candidates for medicine. The number of women thronging into medicine just now fills me with some anxiety, and I regret that the relatively lower standard of the matriculation examinations for medical students, in London and also in Scotland, encourages the girl, who has difficulty in reaching a high standard in several school subjects simultaneously, to qualify for admission as a medical student. The abolition of compulsory Latin for medical students in the northern universities is, on the whole, to be deplored. The Scottish universities accept both Latin and mathematics on the lower standard for medical students. The General Medical Council accept for registration purposes qualifying examinations which do not include Latin. I hold no special brief for Latin, but I know from experience as a teacher that the girl who does not include Latin amongst her qualifying subjects fails to do so because she was unable to keep up with her Latin divisions at school, not because she was an adept in some other language; her French is, as a rule, equally to seek. The woman doctor, if she is to justify her existence, should be something of a philosopher and a woman of the world, but she will be neither if, after a somewhat exclusively scientific education at school, she rushes through a university medical course, as rapidly as may be, and begins to practise with the least amount of delay. The average man practitioner of fair medical skill is frequently deficient both in knowledge of the mind and in knowledge of life. What is a serious defect in him becomes yet more fatal in a woman, and with our increasing perception of the inter-relation of mind and body and the reaction of social conditions on individual and public health, it is a reprehensible shortcoming to acquiesce in such conditions. I would like every woman aspirant to medicine to have some quite definite training in philosophy, more especially psychology, and in social science before she is launched in practice. The mere exercise of her profession will teach her much, of course, but she should not have to rely for these two important factors in her life's work on mere empiricism. This suggestion adds, I suppose, quite considerably to the length of the medical course. It would be facilitated, however, by an education at school which was really liberal, and it is hampered by one which is too exclusively scientific in the narrower sense. Any shortage in the acquisition of scientific *information* at school can be compensated for to some extent by the employment of scientific *method* in other studies, as the Report on the Position of Natural Sciences in Education has so ably pointed out.

To supplement my remarks, I have made a rough sketch of the work in science which it is possible for girls who are aiming at qualifying for medicine to accomplish in four years at a school like St. Leonards, which has up-to-date laboratory accommodation and an experienced teaching staff. The standard ultimately attainable is that of admission to a degree course at a university. We consider further that the science work as planned leaves a sufficient margin of time for general education to proceed concurrently with it. The main point to be noticed is that up to the age of the first school examination—about sixteen—we should not differentiate between medical students and girls proceeding to other professions. Much that I have wanted to say has been anticipated by the publication of the Committee's Report. I may add that a school like St. Leonards would be both able and willing to prepare girls while at school for their First Professional Examination. The practical drawback would be that the small number of candidates for such a course would make it expensive in labour and money.

SUMMARY.

1. Girls should begin physical science at thirteen years.
2. Schools with adequate laboratory accommodation can easily undertake the practical work up to the standard of the university courses.
3. Girls should not attempt to specialise in science until they have reached a recognised standard of general education, including a course of physics and chemistry—for example, that required by the O. and C. Schools Certificate. This standard should be attained during the sixteenth year.

4. Girls should specialise in science during the last two years of school life, *i.e.* during their seventeenth and eighteenth years.

5. Girls proposing to study medicine should attend most of the same lessons as those who intend to obtain a degree in natural science, and have, in addition, some extra work in biology.

[Miss Bentinck Smith submitted a scheme of work showing how the school curriculum could be adapted to provide the required scientific foundation for intending students of medicine.]

XXXIX.—THE RELATION OF SCHOOL EDUCATION TO THE STUDY OF MEDICINE.

By J. ALISON, M.A., Headmaster, George Watson's College, Edinburgh.

YOU are engaged, I believe, in the consideration of the whole course of training for the medical profession with a view to suggesting improvements in it; and the particular part of the course now engaging your attention is the preliminary portion, including the school training and the work for the First Professional Examination. I take it as a great honour to be asked to contribute to your discussion. The subject appeals very strongly to me as headmaster of a school which supplies many recruits to your profession, and I am pleased to have the opportunity to put before you opinions which are the fruit of a somewhat long experience.

The first topic to which I would direct attention is the standard of the Medical Preliminary Examination.

1. The General Medical Council enrol as students boys who pass an examination on what is known in Scotland as the Intermediate Certificate Standard, and this standard is accepted by the Scottish universities as adequate for entrance on a course for a degree in medicine. For graduating courses in any other Faculty the higher entrance standard of the leaving certificate is demanded, a certificate which may be granted only after two years' further attendance at school. The conditions laid down by the Carnegie Trust for payment of medical fees and the general raising of the school age in Scotland have tended to increase the number of boys who enter the medical course with this higher qualification. It is said that about 60 per cent. of the enrolments under the General Medical Council are on the higher standard; but I believe that of the students who entered Edinburgh University this session the number who had reached the higher standard formed a much smaller percentage. There does not seem to be any apparent reason why your profession should stand alone in admitting even 40 per cent. of its entrants on a lower standard than that demanded by other professions. I should suggest that this Club use its great influence to induce the new Entrance Board, when established, to demand the leaving certificate or its equivalent from every candidate for admission to the Faculty of Medicine.

2. In the second place, I note that in the Medical Preliminary Examination science has no place in the list of subjects. The omission is at first sight rather startling. The explanation, of course, is that

when the subjects of examination were chosen science was not yet established as a school subject. It has in sad truth taken the universities and the Medical Council a long time to find out what the schools are doing, and I fear that even yet the universities do not fully realise how powerful their influence is, either in helping or hindering the development of the schools. Had we even had the option of offering science as a preliminary subject for the last twenty years science would have established itself more easily in the schools; at any rate, it could not now have been said, as it can with truth be said to-day, that the planting and nurture of science in the Secondary Schools of Scotland is due to the much-decried Scotch Education Department alone and not at all to the mothers of learning—the universities.

Things have, however, moved a little, and in 1915 science was admitted as a subject in the Arts Bursary Examinations. That already has given a strong impetus to the study of science in the schools. After the Arts Faculty has thus conceded the claims of science to compete with other subjects, the Medical Faculty cannot any longer afford to ignore in its examinations, and thus to discourage in school work, a subject so vital and so fundamental to its studies and methods.

Having touched on the standard of the Preliminary Examination and on its subjects, I wish to submit another point which has often occurred to me. It concerns not the scientific side of the medical man's education but that broader culture which every university graduate should carry out into the world with him.

Thirty years ago it was quite common for the clever lads to leave school at sixteen or seventeen, to take an arts course and then proceed to medicine. But now that the school age is more generally extended to about eighteen there is not time for such a long course of liberal education, if a man is to be fully equipped for his life work by the age of twenty-five or twenty-six years. The loss in some directions is more apparent than real. In Latin and mathematics, for instance, the Higher Leaving Certificate papers to-day are fully as difficult as the degree papers in these subjects in the old days, and our pupils as competent in these subjects as the M.A. of that time. But in one direction I see manifest loss and imperfection. Every well-educated man, it seems to me, should have some introduction to the problems of philosophy; should know something of scientific theory and method; of what thinkers have written on the world and our place in it; on the ultimate nature of reality; of good and evil, happiness and duty. He should, in short, have a living conception of man as a moral and thinking being. Now, as things are, boys entering straightway on their professional career may and do miss this department of study, and that loss from the spiritual point of view is tremendous. These subjects are beyond the grasp of schoolboys, but the arts man under the old regulations got a wholesome and often drastic introduction to the subject in the philosophy classes. I do not at the moment see how and when the young medical can be brought into touch with these great themes, but I venture to press the matter on your attention, assured that you too recognise that to an adequate conception of the true scope of your great profession in dealing with humanity there goes an understanding of its moral as well as its physical needs.

I now turn to discuss how by a closer co-ordination of the work of school and medical school some lightening of the undoubtedly overweighted medical curriculum may be effected. Dealing first with the students who enter on the lower standard, I have to say at once that none of the work they have at that stage overtaken can be regarded as equivalent to the work for the First Professional Examination. For the student who enters medicine on the Intermediate Certificate standard, university classes preparing for the First Professional will thus continue to be an urgent necessity. But as regards students on the higher standard the matter requires more extended consideration, and in order that you may clearly understand the educational work the schools actually overtake I shall give in outline the curriculum of a boy from twelve years of age, with particular attention to his training in science. There may be slight variations in different schools, but I fancy the curriculum at Watson's is fairly typical.

Boys come into the Secondary School in Class I. at or if possible a few months before twelve years of age. They pursue what we call the Intermediate Course of study for four years. This includes English, mathematics, science, drawing, and one or two languages other than English. The work in science is continued regularly for three hours a week and covers a course of elementary physics and chemistry. Neither in the time-table of science for any one year nor in the sequence of the entire instruction in science at this stage are these subjects dissociated from each other. For example, the chemistry of air and water is studied after the physical properties of these substances have been experimentally investigated. The time allocated to laboratory work is about twice as much as is devoted to teaching by demonstration, but the masters are not bound by any hard and fast rule in this respect. The course comprises the study and measurement of the more important properties of matter in its three states, such as mass and density, the gas laws, elementary statics and hydrostatics, heat, the chemistry of the elements and their principal compounds found in air, water, chalk, and salt, with quantitative work designed to lead up to the laws of chemical combination and their expression in the chemical equation.

In the first year of the Post-Intermediate Course—*i.e.* in Class V.—the systematic and experimental study of dynamics is begun and is continued throughout the course, embracing that part of the subject up to and including harmonic motion and the elementary dynamics of rigid bodies. The chemistry is continued both in theory and practice to cover in this year the preparation and properties of other important compounds of the non-metallic elements already dealt with, and in addition those of sulphur, phosphorus, bromine, and iodine. The time given in the week is six periods of forty-five minutes, and this time is shared equally between dynamics and chemistry.

When the boys reach the second year of the Post-Intermediate Course—*i.e.* when they enter Class VI.—they are allowed for the first time to specialise and may select one of three courses in which classics, modern languages, or science forms the predominating feature. In this year they are expected to present themselves as candidates for the Higher Leaving Certificate in four of the subjects of their course.

The time allocated to science is now increased to eleven periods per week, and is divided thus: four periods to chemistry, five to electricity, and two to dynamics. The physics is extended to include a complete course of practical magnetism and current electricity in the first two terms, rounded off in the third term by a series of demonstration lectures on the application of the laws of induction to such instruments as the dynamo, motor, induction-coil, and telephone. The laboratory course in the third term is almost entirely confined to the investigation of the laws of optics.

Chemistry is continued in theory and practice in the first two terms dealt with. In the laboratory during the first two terms the work includes the analysis of simple salts, the quantitative methods of volumetric analysis, involving those of standard solutions of acid and alkali, while in the third term an introduction is given to organic chemistry by lectures and laboratory work.

In the third year of the Post-Intermediate Course the science boys go on to more advanced quantitative analysis, both gravimetric and volumetric, and to the further study of organic compounds. The work in electricity and optics is continued, and a beginning is made of the study of wave motion as exemplified in the propagation of sound.

I should point out that the more advanced science work that is now done in schools does not prevent the boys from receiving a broad general education. The boys who specialise most in science in Watson's still give weekly six periods to the study of English literature, nine to mathematics, and nine to the study of foreign languages. We endeavour to give every boy who is likely to follow a scientific career the ability to read French and German.

In the Post-Intermediate Course as I have outlined it you will see we approximate to the standard of the First Professional Examination in physics and chemistry. If we do not quite reach that standard there is no doubt in my mind that we could by slightly intensified work do so. Botany and zoology we do not profess to teach, though many of the boys, through the agency of the School Field Club, develop a healthy if somewhat partial interest in these subjects. In my opinion a boy passing out from a recognised school, who has satisfactorily completed a course of science such as I have sketched, might reasonably be given the right on entering the Medical School to sit forthwith the examination in the relative subject of the First Professional, and, if found competent, be allowed to proceed forthwith to the study of more strictly medical subjects.

XL.—THE SCHOOL CURRICULUM OF BOYS WHO INTEND TO BECOME MEDICAL STUDENTS.

By C. STAGG, M.A., Merchiston Castle.

The discussion of the best curriculum for a boy who wishes to become a medical student would be a simple matter if one could define a typical case, but with the low standard of Entrance Examination there is a wide difference in the capacity of boys who gain admission to the university. There are the boys of good or average ability who go through the school course with credit, and who probably give no trouble at the university, and there are those who, without being able to make their way up the school, and without being able to read or write, can pass the Preliminary Examination.

I shall take the age of thirteen as a starting-point, because it is the age at which they are considered able to begin a course of physical science as distinct from Nature study.

It is desirable that from the age of thirteen to sixteen a boy should learn as many subjects as the time-table and his abilities permit, partly in order that he may find his own level and partly in order that he may discover where his sympathies lie. If, for the sake of simplicity, we disregard the time which may have to be deducted for Bible teaching, drawing, music, or Swedish drill, and assume that there are thirty periods available during the week, every boy at the age of thirteen can devote six periods a week to five subjects. And those subjects will be English, French, Latin, Mathematics, and Science.

At the age of sixteen a rearrangement may be made. For those who hope to do well in medicine, a knowledge of German is valuable, and during their last two years at school they should take German instead of Latin. They may continue the study of the other four subjects, or, if considered sufficiently developed, may begin a partial course of specialisation.

I have assumed that boys will stay at school until they are eighteen, though there is considerable divergence of opinion as to the age at which they should leave. It is not desirable that they should stay too long, especially if they are going to the university, but there is a danger that for one reason or another they may leave before they are fit to take advantage of the teaching which a university can provide. One sympathises with the attitude of a boy who wishes to begin his medical course as soon as possible in order to save time, but his intellectual development, his general outlook on life, must suffer by a premature entrance upon a highly specialised form of training. University classes must also suffer if the standard has to be lowered for the benefit of the unfit. Few boys are sufficiently developed to begin their university course until they are eighteen years of age, and, from the schoolmaster's point of view, one may say that the best time for a boy to go to the university is at the age of eighteen or eighteen and a half.

Those who stay at school until they are eighteen, and have sufficient ability, are taught mechanics, electricity, and magnetism, in the ordinary curriculum. In order to find time for a course on light and sound, they would have to drop French in the last year, and devote the time to science. All the chemistry and physics required for the First Professional could be taught at school without derangement of the existing routine, and without prejudice to a boy's general education. But I am disposed to think that the schools could not successfully undertake the teaching of biology. The supply of men able to teach zoology up to the required standard is limited, and the results would probably prove so erratic that the work would have to be done all over again.

Nor is it likely that the schools could successfully deal with the application of the preliminary sciences to medical problems. Such subjects must be left in the hands of experts.

Teaching by the method of observation is a thing to be aimed at, but when there are twenty boys in a class, they cannot be taught solely in this way.

It would be quite feasible to have a special medical class at the top of the school. There is in many schools an army class, not because the boys are going into the army, but because the Entrance Examination is on lines which do not correspond with the ordinary school curriculum, and candidates require special coaching in certain subjects. There would also be a medical class, if the university was prepared to give some privileges to boys who had reached a sufficient standard at school, and to formulate a definite scheme of what that standard should be. I believe that very good results would follow if some scheme of this kind were introduced, but it would only affect boys of good or average ability. Those of poor ability would not qualify for admission to the class.

Under existing circumstances the majority of those who are going in for medicine do not exhaust the school curriculum; on the contrary, they tend to leave before they are considered fit to begin even a partial course of specialisation at school, and they are encouraged to do so by a very low standard of Entrance Examination. When a doctor sets up for himself in private practice, he does very responsible work without any check or supervision, and without any necessity of keeping up to date. In view of the very wide powers which are placed in his hands, I have often wondered why it is that at some universities medical students are not required to give the same proof of mental attainment as other candidates for admission. One can only say that a lower standard than that required for medical students cannot be conceived, and that a smart boy could pass the examination at a time when he comes out of a preparatory school.

The schools are almost helpless in dealing with the backward boy who has been neglected in his early youth, and who has not known civilising influences at the mother's knee. They cannot make up for the years that are lost. The best thing they can do is to give the boy some sound advice in order to divert him to another career; but, if the advice is disregarded, they can only submit him without comment for the consideration of the examiners, or advise that he should be sent to a crammer.

To be too ambitious in raising the standard of the Entrance Examination would defeat its own object by sacrificing still more boys to the crammer, but a higher standard in English subjects, at any rate, might be required without danger.

I notice that the points under discussion are mainly connected with the teaching of science in schools, but my own view is that, in the case of a boy who is going in for medicine, the chief difficulty lies, not in science, but in literature. Such a boy probably has a scientific mind. At any rate, he chooses to become a doctor because he finds the subject less uncongenial than others, and, for this reason, he will make as much progress as his abilities permit. The difficulty is to teach him to read and write; that is, to give him the power of receiving ideas and expressing ideas in order that he may derive full benefit from the science teaching.

I do not wish to raise the controversy about the respective merits of a scientific and a literary training. No doubt the controversy was necessary for the overthrow of traditional methods, but now it only does harm. The literary boy is encouraged to scoff at the laboratory as a place of authorised relaxation during school hours, while the boy who is fond of science is encouraged to look upon an interest in literature as a mild form of insanity. The time has now come when science and literature should regard one another not as rivals but as allies.

Criticism has hastened a complete change in the teaching of literature. In the old days, books were treated as a mine of grammatical peculiarities, and as an excuse for elaborate annotation; now they are taught primarily as reading matter. There is a growing determination to cut off all dead stuff, and to bring boys into immediate contact with the life and inspiration which are to be found in literature, whether Greek, or Latin, or English.

Science has at the moment a great opportunity before her. Much has no doubt been done to improve methods of teaching, but I venture to suggest that there is need of still further reform. The laboratory has its own tables of irregular verbs. Too much time is spent in petty wranglings over weights and measurements, in the worship of formulæ, and in the raking over of dead bones. One would like to see science at school taught on broader lines, with only the minimum of time devoted to routine work. The universal passion for routine, the demand for accuracy and thoroughness in every branch of every subject, is one of the most dangerous enemies to be faced. It destroys all true teaching, even if it does not breed a positive distaste for every form of learning.

We profess to believe that life can only come from life, but we do little to stay the progress of the machine which threatens us from every side. If we are to turn out men, and not machines, we must cut off all dead matter and bring boys into contact with a living force in all the subjects they learn. I do not wish to teach them less science, or to damage their science; I wish to improve their science by increasing their powers of receiving ideas and of expressing ideas. Our aim must be to send out, not machines but men with well-balanced, receptive minds, capable of deriving the fullest advantage from the teaching which a university can give, and capable of taking a generous view of life.

XLI.—SCIENCE TEACHING IN SECONDARY SCHOOLS, ESPECIALLY IN RELATION TO THE PRELIMINARY SCIENTIFIC SUBJECTS OF THE MEDICAL CURRICULUM.

By M. M'CALLUM FAIRGRIEVE, M.A.

In these days of stress, when the foundations of all things are being shaken, and new standards of values are being reached, it is good to take all opportunities possible of examining the working of the institutions with which one is acquainted, and of seeing in what points criticisms on them are just, and our ways require amending, and in what points these are unjust, and that duty recoils upon our critics.

I welcome, therefore, the opportunity given by the invitation of the Pathological Club, and thank the good-natured kindness of my fellow teachers of science in Secondary Schools in Edinburgh for the privilege of representing their point of view of the relation of science teaching in schools to the first stages of university medical education. I am aware that, for various reasons, I am likely to do this very imperfectly; in these days one's various activities leave little time for the proper presentation of a case at such short notice; also it is inevitable that a man will speak from the limited horizon of the special circumstances of one school or class of school; but I have had the advantage of hearing the point of view of my fellow teachers put fully in a recent meeting, and I will try to give the sense of that gathering as completely as I can, coloured, distorted, and refracted as it must be by its passage through my mind. To keep up the metaphor, I am afraid that there may be a number of absorption bands in my presentation; but that will matter less, as other science masters may have a chance later of pointing out these omissions.

First, then, we desire to thank the Pathological Club for its kindness in inviting us to be present to-night. We welcome this sign of the awakened interest of the university in the work of the school, and are glad of an opportunity given us of coming more into touch with other educational associations—a thing which is perhaps one of the crying necessities of the teaching profession. From the questions asked us we feel that it is not only we who may derive benefit, and we are anxious that any suggestions we make should be considered as intended to be useful.

From information that we have been able to glean from diverse sources, I gather that it may be as well in answering the questions of the Pathological Club (*a*) to consider, first and briefly, what the schools are actually doing at present in science work; then (*b*) to consider any alterations and improvements which may be possible in the immediate future; then, (*c*) having seen upon what foundations it is possible for the university to build, to suggest certain reforms in the medical curriculum which we consider desirable, and (*d*) to define the respective spheres of influence of the school and university which are desirable in view of economy of time and effort.

(*a*) On the whole, schools in Scotland may be divided for the present purpose into two classes—those in which science is taught from an early age, and those where it begins at a much later age, perhaps averaging twelve or fourteen years.

In schools of the first type, the first science teaching consists of nature study, and there is general agreement that this early stage of science teaching in the case of young boys and girls is best not a systematic course of any one of the sciences, but is of an observational character with a pervading biological trend. Such physical science as is wise to give to children up to the age of ten or eleven is best of the nature of practical mathematics or measurements, though the physical sciences are not altogether excluded.

Then, generally, from the age of eleven or twelve up to that of fifteen or sixteen, there is a general course of physics or chemistry, not always of a very broad character, but one in which scientific methods are generally well instilled. Different schools differ largely in methods adopted; but the course is largely a laboratory one and is often of a heuristic character, where the help given by the master in solving questions raised by himself or the boys in the course of their work is intended to be as little obvious as possible, and the theory of the process is that boys are shepherded, rather than driven, into the right path. The process requires a very able man to make it thoroughly successful.

If science is studied intensively after this, the standard reached may be very good indeed, and is so in some schools.

In the second type of school this course is greatly modified. Young boys are supposed to be fit for the study of a couple of languages before they are capable of science work, and it may be said that little or no science is taught till the age of thirteen or fourteen is reached, and then an inadequate time is allowed. In consequence, the courses given under these conditions are often very different from those of the first class of school, and while practical work is by no means neglected, heuristic methods cannot with advantage find the same place, or, if they are adopted, the ground covered is small.

But while much that with advantage could be taught earlier is thus postponed to a too late stage, and while a high standard of attainment is not reached by anyone who leaves such a school early, a quite reasonable standard of physics and chemistry may be attained by capable boys who pass through the full school courses.

In neither class of school is it characteristic that botany and zoology is studied to a high standard, if at all.

From what I have said it will be apparent that if a boy leaves school at an early age—say sixteen—then, unless he has been at a school where a regular course of five or six hours a week for science is in operation, he will probably be quite unable to take the First Professional from school. On the other hand, if he stays till eighteen, he might very well be expected to attain to the standard observed in physics and chemistry; and, indeed, it may be that some schools approximate to this standard at an earlier age.

(*b*) This is what is accomplished at present, and if certain of our ultra classical friends are to be believed, especially those whose mental horizon has been just a little clouded by their own early upbringing, the present arrangement is the best possible education that can be devised.

But it is only within the last few weeks that there have been published two reports of great interest to education and which an inveterate optimism makes me hope may bring about some changes much overdue.

Some points specifically affecting the teaching of medical students I shall have to refer to later, but I should like here to call attention to two or three proposals which seem to bear the seeds of great improvement in the scientific education of boys at the second type of school especially, though some suggestions should also be of use in the case of the first type.

The Science Commission (Paragraph 31) propose that for the four years twelve to sixteen not less than four periods per week should be given to science in the first year, and six periods in each of the succeeding years *for all boys.* They propose (Paragraphs 43b and 47) that not all this time should be devoted to practical work in the laboratory, but that some of it should be devoted to demonstration lessons on those parts of the sciences which cannot suitably be taken in the laboratory, as they are satisfied that "The spirit of inquiry should run through the whole of the science work and everything should be done to encourage it; but it seems clear that the heuristic method can never be the main method by which the pupil acquires scientific training and knowledge." They also lay stress (Paragraph 56) on the teaching of English by the science master.

The source of the time necessary for this change in Public Schools' curriculum is the greatest difficulty facing a headmaster, but the most likely solution is indicated by the Modern Language Commission (Paragraph 130). "It is a matter of constant but ineffective complaint that 'the curriculum is overcrowded.' If the curriculum is overcrowded, too many subjects must be taught, or too much time must be given to some of them. Can it be alleged that too much skilled attention is given in our Public Schools to History, Geography, Mathematics, or Science? We fancy not. Then it may be that too many languages are taught to the majority." Again (Paragraph 133): "It is probable that the Science Committee will recommend that more time should be given to the teaching of science, especially during the years when the basis of a general education is being laid. . . . We know of no means by which time could be better saved than by a more discriminating use of the hours devoted to languages at school, so that whether a boy learns modern languages or ancient languages or both, each individual should only learn so many as he can hope to bring to a worthy measure of fruition." And (Paragraph 106): "If our principles are accepted, if no pupil goes on to a second language till he shows a good prospect of mastering the first, if no pupil goes on to a third language till he shows like prospect of mastering the second, if no pupil learns three or four languages save those exceptional few who can with profit study more than two languages at school, then the time-table will be less crowded than it is at present."

Briefly, then, the suggestions which I think of greatest importance are these: that science should be studied *by all boys* from twelve to sixteen for five or six hours per week; that part of this time might be obtained at the expense of languages, of which during this stage two at most should be attempted by the better boys, and only one by those not linguistically gifted, and I offer no opinion as to which language or languages should be studied; the use of some of this extra time in the acquisition of scientific ideas of general interest; and the constant use of some of the laboratory period for instruction in English as well as science, by the science master.

The adoption of these principles would have a good effect upon all the pupils of most Public Schools to a greater or less extent, and not least upon those destined for the medical profession. The recurring annoyance of the transference of a boy, capable, but quite untrained, from the classical side of the school to the modern side would be avoided. This transference, by the way, throws some light upon the statement one sometimes meets of professors who prefer boys trained on the classical side to those trained on the modern side, because, say they, classical boys do better work later, even if they are slow at first. I can quite believe it. "For of figs men do not gather thorns, nor of a grape vine gather they brambles." Few of those who develop linguistic gifts early in life are at present likely to escape the meshes of the classical net, and a large proportion with linguistic gifts have often other talents as well. In view of other criticism, may I also suggest in passing that even with regard to the brambles that we send up to the university, it is possible that some of them are beginning to show signs of becoming garden varieties before they leave us, and others have been none the worse of a little preliminary cultivation. To guard against misapprehension, may I say further that I am not criticising the giving of a classical education to a future medical, but I am criticising the postponement of his quite necessary scientific training till too late a stage.

With the courses that might be arranged under this larger allowance of school time, it may be possible in the ages between twelve and sixteen to cover a greater proportion of the syllabus of the physical sciences for the First Professional. This could not be done if we stick to the method of independent observation in practical work; but remembering that our school courses are the only science instruction that boys destined for many other professions are likely to have in their lives, it must be evident that, besides covering instruction in scientific method, such courses should cover the broad outlines of scientific knowledge that should be possessed by every educated man; and it is here, I think, as we approach the higher age, that we may borrow a little from university methods, adapting them to our own requirements. Some portions of these new courses must be done thoroughly, and their mathematical and linguistic possibilities must be fully developed; others must be done chiefly from the point of view of science training in observation and deduction; other fundamental scientific ideas must be filled in by demonstration as completely as the time-table allows; also opportunities for constant revision are desirable till the ideas are part of the mental equipment of the boy, when it will not so much matter if he forgets the *facts* in later years. Courses which are entirely satisfactory from all points of view are still fluid and have not yet crystallised, and some experimenting is required on the part of the teacher.

In the last years of a boy's course at school he should be allowed to specialise, though his general education in language and mathematics should by no means be stopped. If sufficient time were allowed it *might* be possible to cover some ground even in the biological sciences; upon the extent of our effective occupation of this ground we prefer, however, not to dogmatise, as our present experience of teaching the biological sciences is so limited.

(*c*) We have thus been led to the question of the content and character of the First Professional curriculum. Here we schoolmasters have a rather different point of view from that which seems to be suggested in the letter sent out by the Pathological Club. The view is more clearly indicated in the Science Committee's Report. Thus it is stated that in the Faculty of Medicine at Edinburgh (Paragraph 160): "The general feeling is against the recognition of such (school) courses of instruction as exempting from courses in the preliminary scientific subjects in the Faculty of Medicine"; and the Faculty of Medicine at Glasgow puts it even more plainly. They say that "it is not within their knowledge that any Secondary School did, or could, under any circumstances, teach scientific subjects of the scope or up to the standard required for the First Professional Examination in Medicine"—a fairly comprehensive statement, but one which gives point to the feeling expressed strongly at our meeting, that we would very greatly welcome action by the universities to make themselves acquainted with what was being accomplished in schools at the present time. If they care to visit us we will be pleased to show our laboratories, some of which are palatial, others are still quite inadequate in accommodation but have prospect of improvement in this respect; we will be pleased to discuss our courses and generally explain what is being done. We hope to show them that this is often quite good and sound work, for we naturally tend to agree rather with the Science Commission and Sir Edward Schäfer than with the rest of the Medical Faculty. "In some subjects the instruction in Secondary Schools is far more thorough than in the relatively short courses which are all that a medical student has time to attend at the University." "We feel," continues the Report, "that the time which can be given to the basic sciences in the course of one year is quite insufficient unless the students have some considerable knowledge to start with; if they have such knowledge, the universities should give them credit for it; no student should be required to mark time because others know less."

That is quite the position of the science teachers in this matter.

Indeed it is difficult for us to get the point of view of the Faculties of Medicine on this point, for it seems evident that there is a greater chance of soaking in the subjects during a school course than in the shorter time at the university. There is a danger amounting to a certainty that a boy of sixteen has not yet got a *systematic* knowledge of the sciences, assuredly also it is possible to cram up a subject for an examination in a short time, yet it is a much less sound way of acquiring knowledge; so while the work for the First Professional can be crammed up in a year, surely it is a very partial knowledge of chemistry, physics, and biology that is thereby attained, and must be either very shallow or scrappy.

Indeed, to go farther and speak plainly, any penitential robes which some of us feel we ought to wear on account of other things, such as our comparative failure to teach the biological sciences or of the restricted field of our survey of science, we feel inclined to hand over to the university for their own use when they reflect on their arrangement of the initial stages of a medical's career.

We feel that it is a real shame to make such boys as have gone through the bulk of your elementary syllabus go through it again without a reasonable prospect of reward. We look at your syllabus of work and realise that it would be difficult, on our standards, to overtake all there laid down. We consider the time that you devote to the subject, and we look at your examination papers and realise that it would be much less difficult to get up to any standard likely to be attained in practice. One of the strongest feelings expressed at our meeting was that much of what is taught in the preliminary classes at the university might reasonably be required as a test of fitness of entry to the medical career. My fellow science teachers also specially request me to point out that the standard for the Preliminary Examination for medicine is on a lower plane than that of other professions and that it ought to be raised, and a further suggestion was made that two compulsory subjects for the Preliminary should be English and science. So strongly were these opinions held by some, that they were declared to be fundamental to any useful discussion of any other questions asked of us.

It does seem evident that boys who go up to the university need to be divided into two classes: those who have had adequate preliminary training and those who have not. The second class are either not yet fitted for taking up medical studies, or are naturally gifted but unfortunately educated youths, and a different course of instruction should be provided for them than for the first class, who with their preliminary knowledge should not be *compelled* to attend such a course. Doubtless these better trained youths would benefit by going over a more advanced course if time permitted, but they can derive little benefit by going over again an elementary course alongside of comparative beginners.

The general effect of this suggestion, if adopted, would either be to raise the standard for the basic sciences in the First Professional, with the possibility of even greater development of their specifically medical aspects than at present is possible; or, if it is considered that this raising of the standard is unnecessary, then a year or a portion of a year might be saved to these better boys for their more purely medical studies.

(*d*) We feel, then, that in the physical sciences at any rate our work at school should tell in the Preliminary or in the First Professional, or in both, and that the boundaries of school and university should be more closely delimited. Schools might, and perhaps should, teach some biology; and it might be worth while to consider whether the Preliminary Examination in science should consist of the three subjects of Chemistry, Physics, and Biology (with a higher standard in the First Professional); or secondly, whether it is not possible to give the First Professional less of a medical aspect and make it more what could be expected from an advanced school course; or thirdly, to keep things as they are and let boys take only the more physical part of the examination from school.

"*Ne sutor ultra crepidam*," and we are unanimous that the teaching of medicine, or the giving of a specially medical trend to our tuition is not our business. The general education of a boy is the work of the school; his professional education is that of the university; and while his later years at school can be, and ought to be, somewhat specialised, yet this is not to say that they can be devoted to technical training. Hence while it may be possible to teach chemistry, physics, botany, and perhaps zoology up to an even higher standard than at present obtains, yet we have to remember that not all our science specialists are going to become medical students, and such of these sciences as we teach should be taught from a rather broad point of view, even though for training purposes certain portions are found suitable for intensive study. It is not wise to gain specialised education at the expense of the continuance of general education.

There is also another point to make in this connection. Is not eighteen an early enough age to go up to the university? At sixteen, is a boy really fitted to become a university "man" with advantage to himself or others? I must express my regret at the present tendency for the untrained and immature lad to go off to the university at an age when he would derive the most benefit from his scholastic activities, including those not specially scientific. It is possible that, as a result of the war, boys may have to start special preparation for their life work earlier than is desirable, but it is a pity to encourage it. Hence, if it could be recognised what work was the province of the school, and what of the university, it might help to make the leaving age more uniform with advantage to both school and university. That it would be of advantage to the boy to stay on can scarcely, I think, be denied, for in their later years at school prospective medical students would not study science exclusively. They will be better scientific men if they still keep in touch with languages and other features of a literary education as long as possible.

Some may fear that if science were started earlier than it is at present in the schools of the Public School type the general education of the average boy would be deteriorated. I do not think so. I expect it would be greatly improved, and especially so in the case of some of the flotsam and jetsam who at present get less benefit than their fellows from their discouraging efforts in early language specialisation but who have good stuff in them naturally. I do think that if the chief recommendations of these two Commissions were adopted they would allow of an even better general education of the average boy and a more balanced one for the best boys; and if the schools and the universities could come to an agreement as to their respective spheres of training, it would be greatly to the advantage of both parties and would have a valuable effect in connection with the training of medical students.

DISCUSSION.

Dr. Norman Walker.—The Medical Council has come in for a fair amount of criticism to-night—some of it deserved, and some of it not. I would, however, remind you that the Council is the General Council of Medical Direction of *Great Britain* and *Ireland*, and that it is not possible to impose a higher standard for the preliminary examination while there are still some people who think the present one is sufficiently high. But the war has done something, and, I think, will do more for this particular branch of medical education. At present there is, as everyone knows, a very great influx into the profession, and I am told on excellent authority that some of the entrants are boys whose parents are anxious that they should escape military service, and who are therefore being started as early as possible, so that at eighteen they may pass their Second Professional, and are thus exempted; and others are women who would be better employed in the simpler details of, say, munition work.

The position of the Medical Council with regard to the Preliminary Examination is that a certain minimum is required, and I am entirely in agreement with everyone who says that this minimum is regrettably low. But the Council does not lay down a maximum, and there is no university or licensing body which is not free to make its preliminary examination whatever it likes. A medical school is free to refuse to admit to its classes anyone who has not taken a degree in Arts, or it may lay down that the Higher Grade Certificate must be achieved. Mr. Alison mentioned that about 60 per cent. of the enrolments under the General Medical Council are on the standard of the Higher Leaving Certificate. I have some difficulty in accepting this. I should have thought the figure would have been much lower. I think the Scottish Universities have just now a great opportunity before them of combining to insist upon the higher standard. Even from the purely material point of view I could not give better advice; it pays to raise the standard. The widest entrance gates to the Medical Register are not those through which most entrants pass.

The Medical Council for a long time, as you all know, held out on the question of science teaching in schools. At last, owing to the pressure of the English Corporations, it was accepted. The English Corporations first recognised schools. The Scottish Corporations followed suit, and for a good many years it has been possible for a boy or girl in Scotland to pass the First Professional for the Triple Qualification on the chemistry and physics learned at school. It has, I think, been possible for ten years; and no one has ever done it, because the universities rule the roost here. The Regulations require that the school shall be inspected by a licensing body and recognised by the General Medical Council as a place in which the subjects can be properly taught; and there are only four schools in Scotland which have taken advantage of the opportunity—the Academy, George Heriot's, George Watson's, and, in Glasgow, Alan Glen's. In England all, or almost all, the leading Public Schools have submitted to this inspection and recognition. One knows from one's own family circle that it is possible for a boy to go to an English university and to pass the chemistry and physics of his First M.B. before he enters the doors of Cambridge, certainly to pass three months later. The fault does not lie with the General Medical Council that the student in Scotland has not the same opportunity. I am quite sure I speak for the majority of the General Medical Council when I say that we shall welcome any amount of pressure to raise the standard of the preliminary examination.

Dr. Knott.—It is rather curious that people forget history so soon; they do not remember, for example, that the Medical Faculty of Scotland had a preliminary examination, which included mechanics, in the days when some of us were younger, and that that preliminary examination was abolished under the new Regulations which brought in the present preliminary of a purely literary kind, except for mathematics. It is well to bear in mind that at all events the Medical Faculty had its eyes open to the necessity of a student entering with some knowledge of mechanics. When this was taught as a preliminary subject, physics was included as a course; this began in 1892, and has continued ever since. Unfortunately, the physics that is taught in our university and all the Scottish universities consists only of a very short course, since one cannot put a fourth subject into a First Professional group, and give it more than fifty meetings. Fifty meetings are insufficient to give any boy fresh to the subject a knowledge of physics. That is one of our great difficulties. This summer it is my duty to teach a class of ninety girls physics. I took a show of hands a few weeks ago to see how many of these girls had had physics at school, and only about a dozen held up their hand

As regards the teaching of physics in school, I have always been of opinion that there is a kind of physics which only the maturer mind can grasp, and which therefore cannot be taught in school, because the pupil has not attained that maturity of mind which will enable him to appreciate generalisations. Physics, as it ought to be taught in the university, should be a subject in which we emphasise *generalisations*, so that it is a great thing undoubtedly to have our students coming up to the university with a foundation of physical fact. It is essential for the medical man to know the subject in a way which will bring together the fundamental facts and the fundamental principles he has learned. I do not think this can be taught in school.

It would be a pity if science should encroach too much on humanistic studies, and I agree with Mr. Alison that some philosophical teaching should be given to students who intend to take up medicine. The difficulty of including this, however, in a crowded curriculum must become greater and greater.

Botany and zoology, I am afraid, are out of the question for school teaching, so that the matter really resolves itself into chemistry and physics. The suggestion that a boy might pass the examination set in physics and chemistry for the First Professional direct from school is no doubt a very good one, and might be carried out. Some boys make a great deal of their school teaching, but a great many boys cannot do so.

Professor Ritchie.—The resolution of the Committee to devote a night to the study of the preliminary subjects, aided by the people who are responsible for the preliminary education of the medical student, has been more than justified by the papers we have listened to to. Our ideas have been clarified upon many points, and upon one especially—viz. the age at which a boy should commence medicine. The general agreement that eighteen is the age of choice is important from this point of view, that amongst the many reforms required in the medical department it may be found advisable to legislate to prevent boys or girls entering upon the study of medicine until they have attained a certain age. The facts laid before us to-night will be of great value in reaching a settlement of this question.

There seems a general unanimity that the question of the Preliminary Examination must be approached at once, and that the aim must be to raise its standard. The passing of the prospective new Preliminary Ordinance will, I hope, effect this. Dr. Norman Walker has brought forward one important point in relation to this, viz. that it *pays* to insist on a high standard. We have had in Edinburgh during the last ten years a good example of this. I refer to the raising of the standard of the Fellowship of the Royal College of Surgeons, which, it is well known, has multiplied the number of entrants for that examination very considerably. In this connection there is a point to be emphasised, namely, that in the universities of Scotland we must legislate for the Scottish boy. We have coming to the universities people from all parts of the world. This, from a material point of view, is quite right, but it should not be at the expense of lowering the standard in our universities; if these people want to come here, they should be compelled to attain the standard of education demanded from the Scottish student, and no other standard. This, again, is a matter which I hope will be dealt with by the new Board which is to be set up to deal with preliminary examinations.

The information we have got regarding the school curricula shows that what most people in the university are, I think, quite prepared to do, is quite feasible, viz. to recognise school science work as equivalent to part of the First Professional Examination. But this is a question which will require a great deal of adjustment, and there will need to be co-ordination between the school curricula and the curriculum in the university. Take the subject of chemistry alone, for instance. It is customary to call chemistry a preliminary subject: in one sense it is; in another it is not. The University of Edinburgh has recently had ordinances passed instituting a chair in Medical Chemistry, the professor of which will, in the first year, carry the student through the present ordinary junior course, while in the second year he will carry him through the course of physiological chemistry now given in the department of physiology; and we hope that in the later years he may take part in the teaching of chemistry as applied to pathology and to clinical medicine. Here we have a new departure which takes chemistry out of the curriculum to a certain extent as a preliminary subject. It is obvious that, carried on in this way, the course must form an organic whole, so that if school chemistry were accepted in lieu of the earlier part of the training which the student gets in the university, the curriculum in the school would have to be adjusted to the work which the professor of medical chemistry would do with the school-taught boy in the later years of his university curriculum. This emphasises the great benefit which might follow from conferences, such as this to-night, between those responsible for the teaching of the schoolboy and those responsible for the teaching of the medical student in the earlier years of his curriculum.

I am pleased to hear both Miss Bentinck Smith and Mr. Alison insist so strongly upon the necessity for a broad humanistic training for the profession.

Many of us feel that the lack of this is a great disadvantage which has followed from the remodelling of the arts curriculum which took place in the nineties, whereby the old training for the M.A. degree was abolished. A strong feeling is springing up in the university that the boy of better ability entering the university to study medicine should not begin his medical course until he has had some further literary training, especially in the subject of philosophy.

Mr. Alison has alluded to the standard of attainment in the boy coming up from school in languages and mathematics as equal to what was required for the M.A. degree under the old *régime.* This means that in order to give a boy the advantages of the old M.A. degree it is only necessary to add to his school training something corresponding to the philosophical and literary curriculum formerly sufficient for the M.A. degree. It is an open secret that in Edinburgh, at least, the Arts Ordinances will soon require revisal, and it seems to me that it may be possible to devise a course of study, ending in an examination, which would provide that philosophical training without necessitating that the candidate shall go through the whole course for the M.A. degree. It will be the duty of the Club to give some pronouncement on this subject.

I regret the position of the teaching of biology as disclosed by to-night's papers. Some of us had hoped that we would be able to receive the boy from school with a considerable amount of biological training which he at present has to undergo after he comes to the university, especially in regard to botany. Botany has always seemed to me a subject which might be taught at school. It is a subject which is absolutely unnecessary for the medical student to study during the medical curriculum. If some elementary instruction could be given at school—for all I know this may already be given before the boy has reached the age of twelve!—he would be provided with all the data which he would require for understanding the medicinal purposes of plants and for his medical career generally.

When to-night's papers are printed, and we can study them at our leisure, I think we will get much out of them which will help in promoting a modification of the curriculum which is urgently called for.

Mr. Alison.—I am not sure that the state of zoological and botanical teaching is so bad as Professor Ritchie has just assumed. I think that there are some schools which go in for botany, and perhaps zoology, and carry them to a standard comparable to what most schools do in physics and chemistry. My point is that if we throw the First Professional Examination open to boys coming from school, they should be allowed to sit in botany, physics, or chemistry, according as they may happen to be prepared.

Dr. Clarkson.—I know that the standard of the preliminary examination used to be very low, and I was not surprised to find that it had risen, because the teaching in so many other branches of professional work has undoubtedly risen since I was a student thirty years ago. I am sure that a good grounding in physics is absolutely essential. I agree that that grounding can be better given at school than in a short course in the university; but there is also something in what Dr. Knott says, that boys, before they are eighteen, cannot get a grasp of general ideas in the way they do afterwards. The average age at which boys begin to get these big general ideas is probably somewhere about eighteen, and it is perhaps well that they should be given a course of physics in the university in which these general ideas are insisted on. But if these general ideas are not based upon some experimental work and some knowledge of the methods of physics gained at school, the course would not likely be of any great value to the men in their medical course.

Mr. Smith of Loretto.—I speak as the head of the science side at Loretto. It seems to me a most admirable thing that the university should get into touch with the Public Schools and the Secondary Schools by holding meetings of this sort. It would be an enormous advantage if occasionally some of the men who are dealing with university education could come to our schools and see the heads of departments and the work that is being done; this would break down the present demarcation between school and university, and would benefit the boy either as a doctor or in any other branch he follows at the university.

Mr. Thomson.—The impression left in my mind was that the teaching in the schools covered the ground in chemistry and physics, but left biology as an ideal which so far had not been reached. Some years ago (before the war) an association of science teachers in Scotland, to which I belonged, made inquiries on that question, and we found that there was one school—I think Kirkcaldy High School—where they taught biology in the intermediate stage; according to the head science teacher it had been very successfully carried on. There may be other cases of which I do not know.

Dr. Taylor.—I am sorry that Dr. M'Nair, the Chief Science Inspector, has not been able to be present to-night. There are more schools than Kirkcaldy High School in which botany is taught on a high standard, although I know in my peregrinations with Dr. M'Nair that the number is not large; I think there are none in which biology is taken up to a high standard. In Dunfermline and down on the Borders they do botany very successfully.

As regards the nature of the science teaching in schools one speaker asserted that there was too much of weights and measures, but later on the representative of the Science Teachers' Association laid down that for the junior science teaching weighing and measuring was practically the most suitable thing they could do. Perhaps most schools do rather too much in the way of measurements, on the mistaken idea that these are the only things that children of twelve or thirteen are capable of understanding. One result is a great lack of interest in science on the part of the children. In view of this, I think it desirable that however much science teaching boys and girls get at school, they should still have some science teaching in the university before they come on to the more purely professional stage.

There is a great deal to be said on both sides of the question as to whether science ought to be taught in the schools; and there is a great deal also in Dr. Knott's contention. I think the real difficulty of the situation is that some students come to the university with a good preliminary science training and others come who have not had that, and we try to teach them all together and in the same way. The cure used to be found in the old arts degree. I know that those in the Greek class who knew no Greek to start with were taught apart from those who did until matters were more equal between them. Something of the same kind will have to be done in chemistry and physics. The absurdity of the university teaching in chemistry for the first degree, whether arts or science, has been forced upon me in the case of a great number of students who had had an excellent science training in school. Their interest was entirely killed by repetition of things they had learned at school and knew perfectly well already. When Professor Walker discovered that there was a large number of students in his class who had a really excellent preliminary knowledge of chemical facts and phenomena, he offered to give those students a different course of instruction, provided they would satisfy him by an examination that they were qualified for it: only one student offered himself. The others held back because they knew that at the end of six months they would have to pass the same professional examination as their companions, and they felt they might jeopardise their chances of getting through by spending their time on the different work.

We have heard a great deal about the extension of the curriculum. All curricula tend to extend, simply because it is easier to add to a curriculum than to reconstruct it from the beginning. We shall have to reconstruct our curriculum by getting rid of many old and obsolete facts. We shall thus make room for new truths, and shall be able to place the teaching of any scientific subject on a truly scientific basis.

Dr. Logan Turner.—I think that the Commissioners in planning the 1889 Scottish Universities Act had in their minds when they introduced science into the arts course its relation to the course of the medical student, *i.e.* they introduced into the arts course four subjects of the First Professional Examination in medicine, in the hope that they would thus stimulate the medical student to take an arts degree in addition to his medical one. I have looked into the figures connected with the results of that arrangement, and I find that there has been no increase—on the contrary I find there has been rather a decrease—in the number of medical students taking the arts course since 1890-91, for whereas in the five years preceding the new arrangement 11 per cent. of the medical students took arts degrees, during the succeeding decade only 7 per cent. did so.

Can the schools and the university not compromise on this question of preliminary scientific subjects? From all we have heard to-night it seems practicable that every boy should come up to medicine with a preliminary groundwork in physics and chemistry from school. All the university would then have to do would be to place a broader structure on it, and from that basis teach the relation of the subjects to the spread of disease and its prevention.

Mr. Fairgrieve said in reply.—I should define biology simply as the elementary parts of both botany and zoology. I think that is the sort of definition that is given in the Science Commissioners' Report. With regard to the amount of biology taught just now, I must admit that at our meeting that is one of the things for which we wore a penitential sheet. We ought to do a little of it in every school; whether in the elementary stage before twelve years of age or later we cannot yet definitely say. We would have to try it first.

Professor Lorrain Smith.—But you could practically undertake all that is required for the First Professional Examination?

Mr. Fairgrieve.—No. Not as at present arranged; that is, we think not, but our position is that we do not know. To find out we would need to try.

The point was raised, Is it possible to take the First Professional Examination straight from school at the present time? In this matter I am afraid I was speaking from two standpoints—my own and that of the combined science masters. The combined point of view is rather that while there may be schools where this is possible, as a rule the syllabus of work laid down will not permit us to reach the necessary standard, so that we have a certain delicacy in sending boys in for the examination even when we are convinced that some of them could easily pass it.

XLII.—THE TEACHING OF NEUROLOGY.

By Dr. J. J. GRAHAM BROWN,
Lecturer on Neurology, University of Edinburgh.

I SHOULD like, in the first place, to thank the Committee for the compliment they have paid me in asking me to initiate this evening's discussion. In what I have to say I shall endeavour to study conciseness and brevity.

1. *How Neurology is Taught under Present Limitations.*—The conditions attached to the lectureship require that not less than forty lectures should be given, but some of them may be clinical, the number of the latter depending on the amount of suitable material at disposal. The object being the training of men for general practice, it has seemed wise not to show out-of-the-way cases, but rather to devote time and attention to those diseases most likely to be met with. [The speaker here gave details as regards the arrangement of the course, the grouping of the various diseases of the nervous system, and the way in which that facilitated study.] Particular care is taken to demonstrate clinically the methods of examination which should be adopted, and to explain the deductions to be drawn from each symptom as it is elicited.

I would emphasise the importance of explaining to students *how* symptoms arise. It is difficult for them to remember the various symptoms of cases unless they understand the underlying reason for them. If a man knows *how* a symptom arises, he will remember *when* it would naturally arise. In other words, we must stimulate the men to thought, and to exact thought. We encounter many difficulties in this direction. I always at the beginning of the course explain to the men that, so far as I have been able to analyse it, the process of reasoning in the diagnosis of a nervous case consists of three steps. The first step is the diagnosis by physiology—What function is affected? What neurones normally subserve that function? The second step is the diagnosis by anatomy—Where do these neurones lie in the central nervous system? What are the relations of neighbouring structures to these particular neurones? The third step in diagnosis is that by pathology—What are the pathological processes which would be likely to affect the neurones involved? In order to understand these points the student *must* know his physiology; and he does not. He has forgotten it. That is perfectly natural, for it is two years or more since he has worked at it. What does he know about embryology, biology, or normal psychology? How can he hope to deal with abnormal psychology if he does not know the normal? It simply means that one has to go over physiology again in regard to each particular department of neurology. This takes a considerable time, and involves many more systematic lectures than would otherwise be necessary. It forms the main difficulty in the arrangement of the present course of neurology. If the men came with a reasonable remembrance of what they had previously been taught, the systematic part of the course could be greatly shortened and the clinical part proportionately lengthened.

2. *How Neurology might be Taught.*—In order to teach, a man must learn; he must learn how to teach, and what he is going to teach; he must learn clarity of exposition and accuracy of statement. These things can only be learned by practice. I should like here to urge those assistant physicians who may in future be called upon to give clinical teaching as responsible physicians that only by practice in teaching can such clarity be attained. The medical waiting-room, the out-patient department, affords ample opportunity for acquiring skill in teaching, and one would not like to hear of such opportunity being neglected. They should also do as much teaching in the wards as is possible. Again, no one can be clear in exposition unless he knows the subject well. Thus, a man who is about to teach must keep himself in touch with all the great advances of recent years in physiology and in pathology, with all the modern developments of diagnosis, with all the modern methods of investigation, and with all the modern means of treatment. It involves hard work, of course, but that work must be done. I would end by speaking of what I should like to see—perhaps the ideal method of teaching. I am afraid it is a counsel of perfection! But limiting myself to neurology, and leaving medicine aside, what I should like would be—taking each of the groups of nervous disease such as I have described—that the men who are going to study a particular group clinically should have a lecture or two on the physiology of that group, on the pathology of the neurones concerned in it, and on the therapeutic relations of that group, along with a description of the general clinical aspects of the group and the actual causes of disease.

There is, too, the broader question, with which I close. Edinburgh is a great medical school. It might be a much greater one. We have, I believe, a knowledge that is far-reaching, but we do not mobilise it. It is impossible for any one man to know all the departments of clinical medicine, of physiology, of pathology, of bacteriology. But one would like to see the whole weight of knowledge of the school converged and mobilised upon those important questions of clinical medicine which arise from time to time and which urgently call for solution.

XLIII.—NEUROLOGY AND THE MEDICAL CURRICULUM.

By EDWIN BRAMWELL.

THE purpose of these discussions is, I take it, to aid the Committee of the Club in arriving at conclusions as to the time which may with justice be allotted to each subject in the curriculum, and as to the manner in which that time may be best spent in the interests of the student.

Those of us who have been invited to contribute papers as a basis for discussion are no doubt expected not only to express opinions, but, if possible, to formulate positive suggestions which may prove of service to the members of the Committee when they come to consider the co-ordination of the curriculum as a whole.

In introducing my remarks I would emphasise the facts that this is primarily an undergraduate school, that the majority of our students ultimately intend to practise medicine, and that the life-work of the practitioner essentially consists in the recognition and prevention of disease, and in the treatment of diseases and of the patients who suffer from them. Consequently, our first aim must be to produce, not specialists, but the highest possible average standard of practical efficiency among our graduates. This is *the* problem to which I propose to confine myself to-night. When the question of post-graduate teaching comes up for discussion, I may have an opportunity of referring to my views as to the question of more advanced teaching in neurology which I think should be provided. The interesting suggestion of Mr. Miles that an Honours course for students might be combined with post-graduate instruction seems to me to open wide practical possibilities.

Neurology is the most comprehensive of the more special branches of medicine. The examination of the nervous system is more difficult than that of any other system of the body, and its affections more varied. The subject is so large in relation to the time available for its study that the teacher is constantly called upon to curb his inclinations and refrain from discussing clinical rarities and scientific facts and theories which will be of little value to the student in his after-career. In other words, he must always regard his subject from the standpoint of the future needs of those he is teaching, and must aim at a sense of proportion regulated by these needs.

I think I may say, without fear of contradiction, that the student's practical knowledge of neurology on graduation, even as regards the commoner symptoms, physical signs and diseases, is of a very low order compared with his knowledge of other departments of medicine. That any student at the present day should be permitted to graduate who cannot, for instance, correctly examine the pupil, the plantar reflex, or the fundus oculi, and who has not a clear idea of the well-known abnormalities these present and of their significance, is inexcusable.

What should be expected of the student? Our aim, in my opinion, should be to give the student a good practical knowledge of (1) the examination of the nervous system; (2) the significance of the more important symptoms and physical signs; (3) the commoner diseases which he will meet with in practice, their diagnosis and treatment; and (4) the leading features which serve to distinguish organic from functional diseases; while (5) he should receive instruction regarding the management of the neuroses and minor psychoses—an aspect of neurology which in my student days was barely touched upon, though these cases constitute by far the majority of the nervous affections with which the general practitioner has to deal.

I now come to the second part of my paper, in which I put forward suggestions which, if carried out, would, I am satisfied, tend to elevate the standard of practical knowledge among our graduates. I would propose :—

Firstly. That the Professor of Medicine might with advantage relegate the *systematic* teaching in neurology to the university lecturer in that subject and any other teachers who choose to give qualifying courses. The university lecturer would thus be directly responsible for the standard of knowledge expected of our graduates, which he is certainly not at the present time. This would, of course, in no way interfere with the inclinations of physicians who choose to give cliniques upon nervous cases or deliver lectures on neurological subjects.

Secondly. I would replace the systematic lectures on neurology as far as possible by a series of demonstrations upon the methods of examination and the commoner disorders of the nervous system, such as I shall presently describe.

Thirdly. I am of opinion that there should always be one question in the final examination upon a neurological subject, and that one of every five or ten students should be examined clinically in neurology.

All lecturers are apt to claim an undue period of time for the teaching of their special subjects. I trust when I suggest that thirty hours be devoted to the series of demonstrations to which I have above referred, and a further ten hours to demonstrations on the examination of the nervous system and the significance of physical signs, that my claims will not appear excessive. In addition, the student might, I think with advantage, be obliged to attend, say, on ten occasions when the lecturer is examining neurological out-patients at the Infirmary, for he would thus be afforded additional opportunities of observing the methods of dealing with patients suffering from functional disorders.

Let me now briefly describe a method of teaching by clinical demonstration, which I would advocate might with advantage supplant the systematic lectures on neurology. Some ten years ago I gave two series of thirty demonstrations of this kind and proved the feasibility of the method. The advantages of this method of teaching are that the student, in whom one assumes no previous clinical knowledge, is taught to observe and to reason that he learns something of the method of verbal and physical examination, and that one can, with a patient as an illustration, give him a vivid picture which cannot, I think, fail to produce a more striking visual impression than any verbal description.

I commenced the course in each instance by bringing into the lecture-room a case of ataxic tabes. Assuming no clinical knowledge on the part of the students, I ask one of them what he observes. Probably he is struck by the unsteady gait. I then describe the gait or ask a student to do so. I next proceed to test the power of the individual muscles against resistance and demonstrate that the difficulty in walking is not due to any muscular weakness. I then demonstrate that when the eyes are closed the patient has greater difficulty in maintaining his equilibrium than when they are open, and ask for a possible explanation of this phenomenon (Romberg sign). I then demonstrate that there is a loss of sense of position in the lower limbs, indicate the manner in which this defect is elicited, and correlate it with the unsteadiness in walking, making at the same time a few remarks with regard to equilibrium in general and indicating diagrammatically on the blackboard the course of the fibres which subserve these impulses.

In connection with the ataxia I demonstrate that the knee-jerks are absent and point out the manner in which these reflexes are to be examined. After a few remarks upon the knee-jerk I proceed to show the hypotonic condition of the muscles, say something regarding muscular tone and its significance, and indicate the manner in which hypotonia is to be brought out.

The pupils are next examined and the significance of inequality or irregularity, if present, referred to. The student is shown how to test the light reflex, and a few remarks made indicating the significance of the Argyll-Robertson pupil.

Any defect of sensation is noted, together with its distribution and features.

After exhausting any obvious signs, I ask the patient of what he complains, and obtain, in his own language, a description of the lightning pains, for instance. One next asks him leading questions in order to obtain information regarding symptoms to which he may not have directly referred. I then elicit, if possible, a history of syphilis; question the patient as to secondary symptoms; examine the penis for the presence of a sore, and refer to the value of the Wassermann reaction and the examination of the cerebro-spinal fluid.

After the patient has left the room I dictate briefly as vivid a clinical picture as I can of the case we have just examined. I then proceed to give a brief systematic *résumé* of the symptomatology of the disease and refer shortly to the morbid anatomy, illustrating my points, it may be, by diagrams and lantern slides.

The pathology, etiology, diagnosis, and treatment are in turn considered.

Finally, in the courses to which I have referred, I showed several cases presenting different symptoms—cases in which there was no ataxia, or in which optic atrophy, gastric crises, an arthropathy, a perforating ulcer, pronounced bladder symptoms, associated general paralysis, and aortic disease were present.

After considering tabes, I then demonstrate cases of poliomyelitis, progressive muscular atrophy, pressure paraplegia and so on, in succession, dealing with each disease in a similar manner. Having shown examples of the more common diseases of the spinal cord, my next endeavour is to give a brief *résumé* and classification of these various affections. The commoner affections of the peripheral nerves, the diseases of the brain, and functional affections are dealt with, so far as possible, in the same way.

The last ten hours of the eight weeks' course I would devote to a series of demonstrations illustrated by clinical cases in which neurological methods and the routine examination of the nervous system are demonstrated and the clinical significance of physical signs discussed in some detail. The student is, in my opinion, in a better position to appreciate a course of this kind as a sequel to, rather than a precursor of, the demonstrations on the commoner diseases of the nervous system which I have described.

In conclusion, I trust that these brief remarks have convinced you of the value to the student of this method of teaching, of the feasibility and efficacy of which I am personally satisfied, as a foundation for personal work in the wards, which, of course, it is in no way intended to supplant.

XLIV.—PSYCHOLOGY AND THE MEDICAL CURRICULUM.

By BERNARD HART, M.D., Physician for Mental Diseases, University College Hospital, London; Lecturer in Psychiatry, University College Hospital Medical School.

At the present time psychology has no place in the ordinary medical curriculum, and, with one small exception, it has no place in the medical school. The exception is constituted by the fact that in certain universities the M.D. degree may be taken in mental diseases, while other universities have in recent years established special diplomas in mental diseases. In both these cases a knowledge of psychology is required, and it forms one of the subjects of the examination. Most schools, therefore, make some kind of arrangement by which the requisite instruction may be obtained, but in the majority of cases it has to be sought outside the walls of the medical school.

The purpose of this paper is to determine to what circumstances the exclusion of psychology from the medical school is due, to ascertain how far this exclusion is justifiable, and, if it is not so justifiable, to consider what place should properly be assigned to psychology in the curriculum, and to suggest certain reforms by which that end may be achieved.

So far as the first problem is concerned—the determination of the circumstances which have led to the exclusion of psychology—it is not difficult to find an answer. That the doctor has some concern with the mental aspects of his patient, and that mental factors play a part in the causation of symptoms and in the effect of treatment, has always been obvious. It might reasonably be thought, therefore, that the doctor ought to have some acquaintance with the science which professes to deal with those very aspects and processes, and that psychology should constitute an integral part of his medical education. If we glance at the history of psychology, however, we shall speedily discover why it has not been admitted to the place which should belong to it.

When, in the late eighteenth and early nineteenth centuries, the sciences definitely burst their scholastic bonds and marked out a territory of their own, psychology lagged behind in company with metaphysics, ethics, and other alien neighbours. Even when it began to move it hovered uncertainly on the border, and did not subject itself to the rigid method of observation and experiment which has built up the other sciences into the solid structures we now know. It merely developed into that mass of crude, uncontrolled arm-chair speculation which filled the text-books of the middle of last century. When the doctor turned to such text-books as these he found nothing to aid him, nothing that seemed to have any bearing on the practical problems of life, nothing that could teach him how to control the mental processes of his patient, nor how to fashion them to the patient's good. Naturally he turned away in disgust, convinced that so far as his patients' minds were concerned he must rely on the vague weapons of "common sense" and "tact," and that academic psychology had no methods to offer him by which he could make these weapons sharp and precise.

It is easy to understand, therefore, that while chemistry, physics, anatomy, and physiology were marshalled into the medical curriculum, psychology was left out, because it had no lesson to teach to the practical doctor; and it must be admitted that so long as it remained the sterile, academic, arm-chair speculation we have depicted it certainly deserved its fate. But during the past half century psychology has undergone a remarkable development, and this development has in recent years been so rapid and far-reaching that it may well be termed a revolution. This great change has resulted from a reform both in its method and its material. On the one hand, arm-chair speculation has been replaced by the method of science, the observation of natural and experimental facts, and the formulation of laws which enable us to explain those facts; on the other hand, this method has been employed to attack the phenomena of practical life and conduct rather than the hazy abstractions which formed the material of the older school. In other words, psychology has been brought into relation with reality, and it has proceeded on the principle that the law of cause and effect holds as much in the psychical as in the physical world, and that the causes and effects of mental phenomena are capable of exact determination. The consequence of this revolution has been that psychology has made giant strides, and, although it has as yet only reached a stage which is infantile in comparison with that attained by many of its sister sciences, it is even now able to offer us knowledge and methods which can be turned to very practical account in the management of our patients.

It will be clear that if these statements are correct the exclusion of psychology from the medical curriculum, however justifiable and comprehensible it may have been in the past, is now open to serious question, and that the time has come when the relationship of the subject to medicine should be submitted to fresh consideration.

In approaching this problem it will be helpful, as a preliminary measure, to determine at what points in the practice of medicine the doctor is confronted with psychological questions of importance in the treatment of his patients. We can then endeavour to indicate briefly how far modern psychology is able to offer practical and effective aid in the solution of these questions. To begin with, it is an obvious error to suppose that the application of medical psychology is limited to the field of insanity, and that it is a weapon only required in the armoury of the mental specialist. On the contrary, it is clear that mental factors play some part at least in almost every case of illness, and that the doctor is called upon to practise psychological methods every day of his life, however roughly fashioned and home-made these may be. We must therefore consider separately the relationship of psychology to medicine in general on the one hand, and on the other to those departments of medicine in which it occupies a place of special importance. It will be profitable, indeed, to subdivide the ground to be investigated into three parts: (1) general medicine; (2) functional nervous disorders; (3) mental disorders.

Psychology in General Medicine.

So far as general medicine is concerned, the practitioner is confronted by psychological questions in two aspects of his work—etiology and treatment. He finds that mental factors play a part in moulding and modifying the symptoms of disease, and he finds that psychological influences are wrapped up in the methods of treatment he adopts, and constitute important elements in the success or failure of that treatment.

The etiological significance of mental factors in general diseases is by no means negligible. It is clear that the symptoms of disease are coloured in widely different tints according to the character and temperament of the patient. A physical disturbance which causes overwhelming distress to one patient may be represented as a mere triviality by another, and to estimate correctly the objective magnitude of the disturbance this difference in the subjective attitude of the two patients must be taken into account. Again, the psychological characteristics of the various phases of life exercise a marked effect in colouring any diseases which may arise. The child, the adolescent, the old man, the pregnant woman present us with clinical pictures of disease, modified not only by the physiological conditions which accompany these periods, but also by the mental characters which belong therewith. Emotional influences, the results of all sorts and kinds of mental disturbances, may profoundly affect the functioning of various organs and thereby alter materially the symptoms produced by disease of those organs. Mental preoccupation with physiological processes, especially with those belonging to the digestive system, may cause a considerable modification in the processes in question, and it is well known that similar results may be brought about by the action of suggestion. These three latter factors—emotional influences, mental preoccupations, and suggestion—are of predominant importance in the causation of certain functional nervous disorders, and will be dealt with from this point of view in the following section. It must not be forgotten, however, that they play a part, although only a minor one, in fashioning the symptoms produced by diseases of unquestionably organic origin.

If these statements are accepted, it follows that some knowledge of psychological processes may be required in order to estimate correctly the etiological factors in any disease, and the only question at issue is whether modern psychology is able to provide us with that knowledge. The answer which may fairly be given is that psychology can give much help in certain respects, very little in others. Character and temperament, and their action, are still rather nebulous and inexact conceptions, and our present knowledge can offer little to the physician that is capable of being turned to practical use. The same statement applies, though in a less degree, to the psychological characteristics of the various phases of life. In both these cases the advance of psychology should promise a rich harvest in the future, but its immediate practical fruits are comparatively insignificant. So far as the remaining factors mentioned in the previous paragraph are concerned, however, the position is decidedly different. A considerable body of exact knowledge already exists concerning the action of emotional influences, mental preoccupation, and suggestion, and some acquaintance with that knowledge can hardly fail to be of value to any practising physician.

Turning now to the question of treatment, the part played therein by factors of a psychological order is still more obvious. The character and temperament of the patient again make their appearance as important, though as yet somewhat indeterminate, elements. On the side of the doctor we have to deal with such influences as "personality," "bedside manner," and so forth. These are also somewhat indeterminate, but a little technical knowledge of psychology can give considerable help in fashioning them to the needs of the patient. Emotional influences and suggestion are all-pervading forces which inevitably attach themselves to every form of treatment and very profoundly affect the result. In certain departments of therapeutics, particularly in the use of drugs, electricity, and hydrotherapy, these influences are so apparent that it seems wholly unjustifiable to leave the student without any exact knowledge of their action, if that knowledge is obtainable. Without it he must either rely upon the uncertain light afforded him by common sense, or he must develop into the cruder type of practitioner whose treatment is based upon a blind acceptance of text-book statements, and a pathetic ignorance of the fallacy of *post hoc ergo propter hoc*. In the treatment of every case emotional influences and suggestion must necessarily play some part, although the practitioner may be absolutely unconscious of their action. If this is so, then it is surely better that he should use them consciously and deliberately rather than blindly and ignorantly. He should at least be taught that they are forces which actually exist, that they are now capable of fairly precise estimation and employment, that emotional influences in therapeutics are not confined to cheering the patient up, and that suggestion has a wider field than the giving of bread pills.

Psychology and Functional Nervous Disorders.

In the department of medical practice which we have so far considered—that of general medicine—the *rôle* of the mental factor, however significant it may be, is at most of subsidiary importance. In functional nervous disorders, however, it occupies a very different position. It is no longer a minor modifying influence, but a predominant causal element.

Since the time of Charcot the view that functional nervous disorders, hysteria, neurasthenia, and other allied conditions are of psychogenic origin has gradually become more and more widely accepted, and the experience gained during the war has tended amply to confirm it, for the war has brought in its train a vast crop of these disorders, loosely grouped together under the popular term of "shell-shock," disorders identical in every essential respect with the hysteria and neurasthenia with which we have long been familiar, though coloured, of course, by the peculiar circumstances of their origin. The urgent problem which has thus arisen in recent years has forced attention to the questions of etiology and treatment, and the consensus of opinion amongst investigators in every country has been that these conditions are due to a chain of causation in which mental factors play the predominant part, and that psychological methods of treatment provide by far the most efficient means for dealing with them. Moreover, this war experience has enabled us to obtain a more exact knowledge of the mechanism by which psychological processes may produce symptoms of disease, and to make more precise and accurate the methods by which they may be attacked.

It has been pointed out that these war cases are identical in every essential respect with the psychoneuroses of civil life, and it is a simple deduction that the methods which have proved to be so efficient in the former should be of value in the latter. Now the psychoneuroses of civil life constitute a department of medicine that cannot be left to the exclusive care of the specialist. They are far too widespread and ubiquitous, for every doctor can bear witness to the considerable proportion of his patients which fall into this category. It would seem reasonable to require, therefore, that the general practitioner should have at least an elementary acquaintance with the etiology of these disorders, and that he should not be left with the sterile idea that sending the patient for a sea voyage or a rest cure exhausts all the possibilities of treatment. Again, this knowledge is of fundamental importance from the point of view of prophylaxis, for there can be no question that a great number of cases of functional nervous disorder are confirmed and prolonged by the erroneous methods of treatment to which the patients have been subjected.

PSYCHOLOGY AND MENTAL DISORDERS.

That a knowledge of psychology is necessary for the understanding and treatment of mental disorders may be accepted as an obvious truth. It may nevertheless be questioned whether its importance here is any greater, or even so great, as in the functional nervous disorders we have just considered, for in certain forms of insanity—general paralysis for example—although the mental symptoms may dominate the clinical picture, the chain of causation is composed almost entirely of factors of a physical order. The essential structure of the disease depends upon the lesions produced in the brain, and it is doubtful whether psychological processes have played any part at all in the history of those lesions. All that psychological processes have done is to colour the symptoms in particular tints and shades. In the case of many other types of insanity it is still an open question how far their origin is analogous to that of general paralysis, or how far mental factors have played an active part in the chain of causation. The paradoxical statement might indeed be made that while functional nervous disorders are certainly of "mental" origin, some mental disorders are certainly, and many others probably, not of mental origin at all. However, although these considerations may give rise to some interesting reflections concerning the possibly greater practical importance of psychology in the one department of medicine rather than in the other, it is certainly indubitable that a knowledge of psychology forms a necessary part of the equipment of the psychiatrist. The only question which concerns us here is how far mental disorders should be left entirely to the specialist, and how far the general practitioner must take them into account. My own opinion is that in the main they must be handed over to the specialist, for the general practitioner has neither the time nor the opportunity to acquire that degree of knowledge which is alone of practical value. For the latter some acquaintance with the subject is of course essential, but it should be rather an acquaintance with broad general principles than with a mass of text-book details which cannot fail to be sterile unless illuminated by adequate clinical experience. These broad general principles will enable him to recognise mental disorder in its early stages and to learn something of the therapeutics by which they should be met. And this amount of knowledge will necessarily involve at least an elementary grounding in practical psychology.

THE PLACE OF PSYCHOLOGY IN THE MEDICAL CURRICULUM.

We may now attempt to summarise the position so far reached. We have found that mental factors enter into every department of medicine, and that some knowledge of the action of these factors is a necessary adjunct to treatment. In certain special departments mental processes assume a position of dominant importance. In one of these—functional nervous disorders—an acquaintance with practical and technical psychology is absolutely essential to any adequate understanding of causation and treatment. A detailed and extensive knowledge can only be expected from the specialist, but these conditions are so widespread and bulk so largely in the practice of every doctor that some equipment in the subject must be demanded from the general practitioner. In a second special department—that of insanity—a knowledge of psychology is also essential, and the general practitioner must at least be sufficiently grounded therein to enable him to recognise and appreciate the real significance of the early symptoms of mental disorder.

If these statements are accepted, it will be clear that every medical student should receive a certain amount of instruction in psychology and psychopathology, and that the absolute omission of these subjects from the curriculum can no longer be justified. The lack of this instruction is responsible for the narrow and crude materialistic conceptions, covered with the dust of the mid-nineteenth century, which still linger in the mind of the present-day student, although they no longer have any place in the structure of modern science. It is responsible for the floundering of the average practitioner when he is faced with problems where mental factors are concerned, for his feeling of helpless impotence when he has to deal with functional nervous disorder, and his vague conception of mental disease as an inexplicable phenomenon only to be met by purgatives, change of air, and the attentions of the relieving officer. It has grave indirect consequences, moreover, in that the student is given no adequate foundation upon which special knowledge may later be built. Hence there is no avenue of approach by which he may subsequently proceed to post-graduate study in the special departments of functional nervous disorder and insanity. The entry to these special departments can only be accomplished by a leap, for which there is no preparation in the ordinary curriculum, and the natural result has been that post-graduate study in such subjects is starved because the idea of undertaking it simply does not enter the mind of the student as a possible development of his medical course.

Provision must therefore be made for the teaching of psychology and psychopathology in the undergraduate curriculum, while more advanced courses should be available for those wishing to undertake post-graduate study in the special branches of functional nervous disorder and insanity. These latter courses must be so designed that they follow as a natural further development of the knowledge gained by the student during his undergraduate career.

We are now in a position to consider what definite suggestions may be made as to the scope and character of the teaching required. As the necessities of the undergraduate and post-graduate will naturally be very different, it will be desirable to deal with these two problems altogether apart from one another.

SCOPE OF TEACHING IN UNDERGRADUATE CURRICULUM.

Although it seems clearly necessary that the medical student should acquire some knowledge of psychology and psychopathology, the actual introduction of these subjects into the curriculum is fraught with many difficulties. The curriculum is already overloaded, and any proposal to increase the student's burdens by the addition of new courses must naturally be approached with extreme circumspection. Otherwise the mental indigestion, from which every student inevitably suffers with things as they are now, will be rendered more acute, and the reform we are bringing forward will defeat its own object, because all assimilation of the nutriment provided will be impossible. It is very necessary to preserve a proper sense of perspective and to guard against the danger, to which every teacher is only too liable, of regarding one's own particular subject as the corner-stone of the temple. It is indeed probable that the solution of these difficulties cannot be achieved so long as the education of the medical student is conducted along its present lines, and that the problem will only be satisfactorily met when the radical reform of the whole curriculum, which is now becoming clearly foreshadowed, has emerged on to the stage of practical politics. However, some answer to the question must be attempted, and it will perhaps be best to consider, firstly, how the study of psychology and psychopathology may be introduced into the present medical course, and, secondly, to indicate briefly what position it would occupy in the reformed curriculum of the future. It must be clearly understood that the scheme put forward is only sketched in outline, and that it is purely tentative.

It would seem advisable to divide the teaching of the subject into two periods—an earlier course to be given during the second or third year, and a later course to be given during the fourth or fifth year.

1. The first course should be devoted to instruction in the general principles of psychology and psychopathology. Academic psychology, with its minute analysis of sensations, perceptions, judgments, and so forth, should be reduced to the minimum possible, and attention mainly focussed on the acquirement of knowledge directly bearing on the problems of real life, and likely to be of practical value to the doctor. The student must learn that the law of causation holds as much in the psychical world as it does in the physical, and that he must regard the mental phenomena of his patients as problems requiring a scientific explanation, just as he regards whatever physical phenomena they may display. He must learn something of the causes responsible for our thoughts and behaviour, of their mode of action, and of the laws to which they are subject. Here will be included some understanding of the nature of instinctive processes, emotions, mental conflicts, suggestion, and so forth, and of the effects which they are capable of producing. The goal ever to be held in view is to give the student knowledge which will enable him to appreciate why his patients think certain things and behave in certain ways, and which will teach him how the behaviour and the thoughts can be modified to the benefit of the patient. Stress must be laid upon the intimate relationship which certainly exists between mind and body, whatever philosophical view we may hold as to the precise nature of that relationship, and the student should learn to regard man as an organism which adapts itself to its environment by modes of reaction in which both mental and physical factors play a part. This will naturally involve a close correlation with physiology, and for this reason the course would seem best placed in the third year of the curriculum, when some knowledge of physiology has already been acquired and its study is still being pursued.

2. The later course will be mainly concerned with the application of the principles learnt in the preliminary course to the problems of general medicine, and in particular to those special departments of medicine in which psychology and psychopathology play a predominant part. Here the student will be taught how disease may be influenced by mental processes, how such factors as emotion and suggestion may modify the symptoms presented by the patient, and how these factors may be controlled and utilised as therapeutic agencies. Secondly, this course will include elementary instruction in the psychological mechanisms underlying functional nervous disorders, so that these conditions need no longer present to the practitioner an incomprehensible and intangible puzzle. Finally, the psychological aspects of insanity will be dealt with, of course in close correlation with the

physiological and pathological aspects of the subject. Both here and in the case of functional nervous disorders the teaching will naturally be associated with clinical instruction in the out-patient department and in the wards. This course will, therefore, evidently fall into the fourth and fifth years of the curriculum.

It is not suggested that there should be any extension of the psychiatry course now given. It has always seemed to me impossible for the student to acquire any useful knowledge of the details of insanity in the time and with the material at his disposal, and I am of opinion that the time would be far better spent in learning broad and fundamental principles rather than in a detailed study of mental diseases and differential diagnosis. These broad and fundamental principles would naturally be included in the course sketched out above, and in this way the student would gain a vastly more comprehensive view of the essential foundations of the subject and of its relationship with other departments of his work. Obviously some attention would need to be given to the practical problems in dealing with insanity which are likely to confront the practitioner, but these are really dependent much more on a knowledge of general principles than on a minute acquaintance with the different types of mental disease. The legal aspects of insanity, methods of certification, and so forth, might well be left to the department of forensic medicine, where they properly belong.

I will make no attempt to decide what place should be given to psychology and psychopathology in the examinations. This is clearly a subsidiary matter, dependent upon the precise shape into which the courses suggested above are finally fashioned. To ask for separate papers in these subjects would indicate a lack of perspective, and an occasional question in the physiology and medicine papers would probably meet all that is required.

Some such scheme as has been outlined would seem to be the only way in which psychology and psychopathology can be introduced into the present-day curriculum. It involves the addition to the student's burden of new subjects, new courses, and new teachers, and the justifiable objections to which such a proposal must inevitably give rise have already been mentioned. It has been indicated, moreover, that these objections can probably only be met by a radical reform of the whole curriculum, and we may now turn to the consideration of the bearing of this reform upon our subject.

The reform which one has in mind and which has already had many advocates consists essentially in a greater co-ordination of the means of education, and in constantly keeping in view the real goal of that education—the manufacture of an efficient practitioner. By co-ordination it is hoped to get rid of the system which throws subjects into the student's mind, leaving them to settle into their proper places and relationships as best they can. These subjects must be co-ordinated into a homogeneous instruction, which will finally qualify the student to deal with certain phenomena. Now these phenomena, which constitute the field of activity of the doctor, are the behaviour of man as an organism, which reacts in certain ways to its environment, and whose reactions are capable of being influenced by certain methods. This conception would seem clearly to be the foundation on which medical education should be built, and its mere postulation answers sufficiently the question as to whether psychology should play a part therein, for psychological factors obviously enter into the behaviour of man as an organism, and into the methods by which his reactions are capable of being influenced. In other words, they must be taken into account both in etiology and in therapy. But they should be taken into account not as an isolated subject pitchforked into the midst of an ill-digested mass of other and apparently disparate subjects, but welded into their proper place and perspective in the structure of the course, and correlated at every step with the material and conclusions of the sister sciences. No doubt the fundamental and elementary principles of psychology and psychopathology must be taught in a separate course, as is now the case with physiology, anatomy, and chemistry, but we may hope that the medicine, materia medica, and therapeutics of the future will utilise and coordinate the weapons provided by psychology as much as, and in association with, the weapons provided by physiology, anatomy, and chemistry.

SCOPE OF TEACHING IN POST-GRADUATE CURRICULUM.

Post-graduate teaching lies outside the main thesis of this paper and will therefore only be dealt with very briefly. There are two departments into which psychology will naturally enter—functional nervous disorders and psychiatry.

So far as functional nervous disorders are concerned, post-graduate teaching must provide for an amplification and extension of the elementary treatment of the subject furnished by the undergraduate course. This will involve a more advanced course of psychology, close correlation with associated teaching in neurology, and clinical instruction in the out-patient department and the wards. The various methods of psychotherapy will naturally receive full attention.

The provision of adequate post-graduate teaching in psychiatry is dependent upon certain urgently needed reforms, for which there is already a rapidly increasing demand, and which we hope will shortly emerge on to the stage of practical politics. These reforms, which require alterations both in the law and in the constitution of the medical schools, cannot be given any adequate consideration here, but we may very shortly summarise the actual state of affairs and indicate the obvious direction for improvement. At the present time, although provision is made for the housing and treatment of advanced cases of insanity in asylums, which for comfort and care are among the first in the world, there is hardly any provision whatever for the treatment of early cases of mental disorder; that is to say, for cases in those stages when treatment evidently has the best chance of success. For these early cases, except for those with considerable means, practically no institutions exist where treatment can be obtained, and the only course available is to wait until the patients become sufficiently bad to be certified. Then the State will willingly take charge of them, house them, and give them every care and attention. Such a situation would seem incredible, but, except for one or two isolated places where some attempt has been made to face the problem, the above description is literally true. Some of the general hospitals have in recent years established out-patient departments in which early cases of mental disorder can receive advice and some treatment, but out-patient treatment, valuable though it is as an adjunct, is hopelessly inadequate for patients of this type. Moreover, the present condition of things involves almost a complete divorce between the teaching of psychiatry and the main body of the student's education, and offends absolutely against the co-ordination and integration which is so clearly desirable. The remedy is evidently the establishment of clinics in close association with the general hospitals and medical schools, in which cases of early mental disorder can receive proper treatment. There are difficulties in the way of this reform, difficulties both of legal and other character, but they are certainly not insurmountable, and the need is so urgent and obvious that only understanding and energy are required to overcome them.

These clinics will provide for treatment, for organised research, and for teaching. The courses of instruction will include psychiatry, psychopathology, pathology, clinical and laboratory work, all of which should be developed in as close association as possible with the other departments of the medical school, and, finally, the clinic must also make the necessary arrangements for the undergraduate courses which have already been dealt with.

The object of this paper has been merely to sketch out in the broadest possible lines the place which psychology should occupy in the medical curriculum. No attempt has been made to construct a full scheme of the courses of instruction, the number and distribution of lectures, nor any of the other details which must necessarily be settled before any scheme is actually put into practice. It is felt that details of this kind can be better determined by a conference rather than by an individual paper. Moreover, we are dealing not with the improvement of a subject which already has a place in the student's education, but with the introduction of a totally new subject, and I have therefore conceived it necessary to devote consideration rather to the arguments which support the addition of psychology to the curriculum than to the question of the precise shape which it should assume therein.

XLV.—THE TEACHING OF MENTAL DISEASES IN EDINBURGH.

By GEORGE M. ROBERTSON, M.D., F.R.C.P., Lecturer in the University of Edinburgh and Physician of the Royal Asylum, formerly Lecturer in the Royal Colleges School of Medicine.

It is assumed that the instruction to be given in this subject to medical students is only such as should instil the knowledge required by a good general practitioner of medicine. The medical student has a great deal to learn; he has only a limited time at his disposal for this purpose, and a just sense of proportion must qualify the aspirations of his teachers, who are naturally zealous that their own subjects should not be neglected. General principles, broad outlines, practical management, and the ability to observe symptoms should form the essentials of the course of instruction. The student who wishes to specialise in this subject must engage in post-graduate study, which is another problem.

The importance of instruction in mental diseases in the medical curriculum has long been recognised. In 1826 Professor Alison informed the University Commission that it was desirable to have a professorship on the subject. Fifty years later (1879) a lectureship was actually established, the first and oldest in the University of Edinburgh. No form of illness creates such anxiety in a family as the occurrence of insanity in one of its members. The treatment of no other disease requires so many complicated arrangements to be made. No disease has so numerous and important legal relationships. On no occasion is the advice and help of a medical man more needed or more valued. It has been truly said that a death in a household does not produce so great a disturbance as a case of mental disease.

A few words must first be said on the subject of the preparation required for this course of instruction. The student must have a knowledge of physiology, pathology, therapeutics, and general medicine to acquire a proper grasp of the subject. At least three-fourths of those who become insane suffer from physical disorders. In my opinion the most important and most frequent cause of insanity is bodily disease. Not only as regards etiology but also as regards treatment is this knowledge required, for we treat the mind through the body.

Only a few years ago a knowledge of the above subjects was considered a sufficient preliminary training for the study of mental diseases. The view was then held that by accurate and exhaustive histological and bacteriological research the cause and nature of insanity would at length be revealed. An English text-book on insanity went so far as to observe that all mental symptoms might with advantage be ignored, and that our attention should be strictly limited to physical signs and symptoms. A revolution has occurred since then. In the interval normal psychology, medical psychology, psychopathology, and psychotherapeutics have made great advances. There are many who now hold that almost all the curable forms and symptoms of insanity are psychogenetic, that their origin can be explained by purely psychological or psychopathological processes, that their cure can be effected by psychotherapeutic means, and that microscopical changes in the brain need not be expected, and that, if found, they do not explain very much.

From the above statement it follows that it is now considered absolutely essential that the medical student, as a preliminary to the study of mental diseases, and, indeed, as a preparation to the practice of his profession, should have a knowledge of psychology. It must be confessed here that in the past the old psychology was of very little use in medicine or in the practical affairs of life. Indeed, a knowledge of it may have been a handicap. During the last generation, however, a new psychology has developed, a medical psychology has been created. A knowledge of these is of great help in giving an insight into the symptoms of insanity, and not of insanity only, but also into abnormal behaviour of all kinds and the conduct of the practical affairs of life.

My first suggestion, therefore, is that a special three months' course of lectures on medical psychology should be provided for the student in the medical curriculum. As this course would not require a knowledge of any medical subject except a limited acquaintance with anatomy and physiology, if even so much, it might be taken at any stage after the first year. It ought to be possible in this special course on medical psychology and psychopathology to include instruction on the principles of suggestion and persuasion, of psycho-analysis, and of the graduated tests for mental defect.

Before proceeding to describe next the arrangements for the lectures on mental diseases, I desire here to bring to the notice of the profession the very extensive clinical field of psychopathic disorders that fall far short of actual insanity or imbecility, which practically lies fallow at the present time, so far as the orthodox physician is concerned. The general practitioner comes in contact with these patients, and it is only in the case of the wealthy, or when some social or domestic crisis occurs, that the mental specialist is consulted. These cases are a source of great worry and annoyance to all connected with them, and little satisfaction is derived in dealing with them. They are quite unamenable to medical treatment conducted on the ordinary lines. These are the cases that drift towards or fall into the hands of faith-healers, Christian scientists, and others. Modern psychology throws great light on such cases, and not only will a knowledge of this subject by the general practitioner help these patients, but it will protect the physician from much worry and introduce him to a fascinating study.

The lectures on mental diseases at the university are at present delivered in the Spring Term of the fourth year of study. For over fifty years they were delivered in summer, and there is no question that the Summer Term is the proper time to hold them. The weather in spring is cold and wet and the afternoons are dark, all of which add greatly to the inconvenience and discomfort of attendance at the asylum.

The present Regulations allow for six systematic and ten clinical lectures. Most importance is, of course, attached to clinical instruction; nevertheless I have found it necessary to give each year a minimum of ten systematic lectures as well as ten cliniques or demonstrations. Two lectures are given each week, and it is a very convenient arrangement to give a systematic lecture on, say, mania or melancholia on the Monday, and to follow this with a clinique on the Wednesday, and then demonstrate cases which illustrate the disorder which I have just described in the systematic lecture. The system of an equal number of systematic and clinical lectures thus works well, and the whole course of twenty lectures fits into a term very conveniently. In order to reduce the size of the class for the cliniques I divide it into two groups, and give a clinique on Friday as well as Wednesday, a half of the class attending each time.

I have lectured on the subject of mental diseases for twenty years. In each successive year I have endeavoured to treat my subject in a more simple and more practical manner. I have limited myself to broad outlines and fundamental principles. I give the essentials, and I do not think it is possible to do so in a smaller number of lectures. It is true I endeavour to cover the whole ground, and I have a good reason for doing so. The subject of mental diseases is not included in the Final Professional Examinations in the University of Edinburgh. There is thus no check on the extent or completeness of the private reading of the undergraduate. In order, therefore, to make certain that no student graduates in Edinburgh who has not had the whole subject of mental diseases placed before him, I make it a point to run over the fundamentals of the entire subject in my systematic lectures.

My distinguished predecessor was very anxious that the subject of mental diseases should form a regular part of the Final Professional Examination. Such a regulation would of course add to the importance of the subject in the eyes of the student, and it would probably increase his industry and attentiveness. This, however, is unnecessary, for in my experience there is no subject in which his interest and attention is more easily aroused than this. It is fresh to him, it is full of human as well as scientific interest, and it is so different from all his other subjects that the most *blasé* student comes to the lectures and cliniques most regularly, and attends in the most exemplary manner. For my part, I would be satisfied if the university authorities permitted me to withhold the certificate of attendance in all cases of doubt. In an important subject such as this, in which no professional examination is held, I think something more than a bare 30 per cent. of marks in the class examinations should be required, especially if the questions set are simple and straightforward, such as are more suitable for a pass than for a competitive examination.

It is a very grave omission that during the final year, after the student has taken out his course of lectures on mental diseases, he often hears no more on the subject. The subject should, however, be kept fresh in his mind during his final year till he graduates, more especially seeing that it is not included among the subjects of his final examination, by one or two lectures regularly delivered during each term. Such lectures have been given by the physician in charge of the mental wards in the Royal Infirmary and have been appreciated. There is usually clinical material for the purpose. Needless to say that lectures at this stage of the student's career could be made very interesting, useful, and practical, owing to the fact that the lecturer would be free and would not be bound down to a definite course or syllabus. Such a series of occasional lectures for senior students would, in my opinion, be a most useful and excellent conclusion to the systematic course of instruction in the class of mental diseases.

While actual insanity forms the main stem or trunk of the subject of mental diseases, it has associated with it vigorous and important branches, some of which are of comparatively recent growth. Of these, the first to be mentioned is mental deficiency. Owing to recent legislation attention has been directed to this subject, and its great importance has been recognised in connection with education, with immorality, with criminal propensities, and with heredity or eugenics. During all the years I have lectured I have recognised the necessity of instruction in this subject, and Dr. Clarkson, Superintendent of the Larbert Institution, has given each year a special lecture and clinique to my students. It is clear that something more should be done. It would be a great advantage if, in addition to seeing the cases at the Larbert Institution, the clinical material available at the schools for backward and defective children in Edinburgh were placed at the disposal of the teaching staffs of the university and the Infirmary. Such an arrangement might be of mutual advantage. The educational authorities would have their children tested and graded by experts in the psychological department of the university, and advice would be given as to how the patients should be treated by those in charge of the Infirmary cliniques. The instruction of the medical student and his practical co-operation would naturally form an essential part of this arrangement.

Another important branch or allied subject is what may be termed psychasthenia, which includes all those lesser psychopathic states which fall short of actual insanity. The war has made it clear to everyone what an enormous field there is of functional nervous states, which are essentially mental or of mental origin, whose treatment is mainly mental. The symptoms of these cases, polymorphic in form and often strangely fantastic, are psychogenetic. They may be due to emotional disturbance, states of confusion, or shock. Suggestion may be readily accepted owing to exhaustion of the will power. The treatment of such cases after they have been carefully investigated consists largely of persuasion and encouragement, and the planning of a well-ordered mental life and a normal outlook.

For all such cases, and for the cases presenting the early and slight forms of insanity, there should be created at the Royal Infirmary a psychiatric department with a psychological out-patient department or clinic. Such clinics are in operation in other great medical schools, and it does not take very long for the public to realise the benefits they confer on the community, and to appreciate them. They are consulted in all manner of social and personal difficulties. Thus, for example, parents would bring children giving trouble and showing moral and mental peculiarities. Defective children in the schools might be tested in this department. Patients threatening to become insane or conscious of impending mental disorder would come for advice, and by the provision of this department not only would mental disease be treated in its early and most curable stage, but an opportunity would be afforded for the prevention of insanity.

I shall now conclude with another suggestion. Those which I have already made are modest and none of them very difficult of attainment: that about to be made will require the provision of considerable funds, and, what is perhaps more difficult to achieve, the co-operation of various bodies who are tenacious of their prerogatives, whose interests are not identical. I would suggest that the Medical School of Edinburgh should possess two new institutions or departments, which would be of civic as well as of academic value. The first of these would be neuropsychasthenic wards attached to the Royal Infirmary. The second would be the establishment of an observation, reception, or clearing mental hospital for all the occurring cases of insanity, or the doubtfully insane cases, arising in Edinburgh, Leith, and neighbourhood.

It is, of course, known that there are mental wards in the Royal

Infirmary containing a very limited number of beds, and restricted to patients presenting certain symptoms. These wards, judging by modern standards, are not worthy of the city of Edinburgh, or of a great school of medicine. In criticism of them it is sufficient to say that according to the Regulations no patient who is known to be suicidal is eligible for admission or treatment in them. What is the effect of this restriction? It practically excludes all cases of melancholia—melancholia, let it be known, being the commonest form of mental disorder, the one which is nearest the normal and is the slightest departure from it, the most reasonable of all forms of mental disorder, the one in which the patient has insight into his condition and is conscious that he is sick in mind, in which the patient often voluntarily consults a doctor and even enters an asylum for protection, and a disorder which is practically always recovered from, except in the infirm or aged, provided that he is prevented from committing suicide.

Not only do these mental wards fail to provide accommodation for mild cases of recoverable insanity, but by not separating cases which are frankly insane from psychasthenic cases they diminish their usefulness for the care of the latter. If there is one point on which such cases are sensitive, it is in being regarded as insane. No doubt they dread they may ultimately become insane, and to be treated beside the frankly insane renders them very unhappy.

For the above reason, and because the regulations and provisions needed for the psychasthenic and the frankly insane are quite different in every way, I am of opinion that the psychasthenic wards and the observation mental hospital should be entirely separate establishments or separate departments in one building.

The psychasthenic department could without difficulty be established in or adjoining the Infirmary. For the cases treated here the newer methods of psychical treatment, including psycho-analysis and persuasion, would be employed. In addition to this, however, as it is found that practically all cases suffering from neurasthenia and psychasthenia are run down, and are suffering from chronic infections, ordinary medicinal treatment, including vaccines of the invading organisms, must be employed as well. It is therefore pointed out that this class of patient would provide material for the diagnosis and treatment of the early stages of those mild infections and chronic diseases which at present the medical student seldom sees and is not lectured upon, although in course of time these conditions lead to incurable diseases.

Such a department would be carrying out prophylactic treatment of the nervous system and the mind. This would really be preventive medicine of the most valuable kind, for we all know how unsatisfactory is treatment of such disorders when they become firmly established. It is the modern as contrasted with the old ideal of convalescent treatment. Both forms of treatment are, however, essentially the same. In the former we strive to restore health after a minor departure, so as to prevent worse from happening. In the latter we endeavour to restore health after a serious departure from the normal, but how often does this treatment come too late? It is hoped that the Astley-Ainsley Bequest will be available for the above purpose.

Finally, with regard to the establishment of an observation, reception or clearing mental hospital for all the occurring insane or doubtfully insane cases arising in Edinburgh, Leith, and neighbourhood. The management, regulations, and accommodation for such a hospital would require to be quite different from the psychasthenic department, and would resemble those obtaining in the hospital block of our most modern mental hospitals. The conveniences and advantages of such an establishment are obvious, and such places are being provided in many of the large and progressive cities of the world. The benefits to the medical school are no less apparent. The establishment would require to provide accommodation for at least twenty-four patients of each sex with facilities for future extension. It would also require to have grounds. A site near the Infirmary would be an advantage. The patients admitted should not be under certificate and should only be treated here for a limited time.

The public bodies who would be chiefly interested in a scheme such as this would be the University, the Royal Infirmary, and the Parish Councils of Edinburgh and Leith. The University would be interested on behalf of the medical student, as all the best clinical material in the city and neighbourhood would be collected and would be available for purposes of instruction; the managers of the Royal Infirmary could not be indifferent to any great scheme for the care of the sick in the city of Edinburgh; the Parish Councils would be concerned as by the Lunacy Acts they are responsible financially and otherwise for the care of insane persons who cannot support themselves. It appears to me highly probable that it would ultimately be found that the managers of the Royal Asylum would be the body which might be able to harmonise the conflicting interests and co-ordinate the energies of these various great corporations. I have made the suggestion, and I have not minimised the difficulties of carrying it into effect, but I am not without hope that the day will come in which the whole scheme as here described will be established.

XLVI.—THE TEACHING OF PSYCHOLOGY TO MEDICAL STUDENTS.

By T. A. ROSS, M.D.

First let me thank the Club for the great honour it has paid me in asking me here to-night.

My friend Dr. Traquair was kind enough to indicate what the problems were with which this paper should deal.

1. What is the kind of and how much psychology should be taught to medical students, bearing in mind that what we wish to produce is an all round, well-equipped general practitioner?

2. To give a sketch of such a course.

3. Are young graduates at present adequately equipped in this respect? The question is not what is a suitable course of instruction in psychological medicine, but how much is necessary for general practitioners.

As medicine grows, the position of the general practitioner becomes one of greater and greater difficulty. Not only should he know all general medicine; but he is urged on all sides to become a specialist in everything. He should keep a small clinical laboratory, do some of his own bacteriology, and not live parasitically on other men's reports, do much of his own surgery, refract eyes, know skins, become a syphilologist, remember his anatomy, his physiology, his chemistry, and of course be such an obstetrical specialist as never to lose a mother or a child. It is impossible. In the cities where there are medical schools, and consultations for rich and poor are easily obtained, he tends more and more to lean on the opinions of others, never tackling any real difficulty by himself. In the country towns he often tries to know all these things and fails to practise any of them well, or else he degenerates into a mere walker in and out of houses. In the cities it is difficult to see a remedy; elsewhere, if the present competitive methods could be got rid of, and the men who live in a district be banded together to do a kind of team-work, each man remaining a general practitioner but adding a specialty, some possibility of good work would probably emerge. General practitioners there must be; a health service run by specialists would be an unspeakable chaos.

Meanwhile the question is, shall we add to the swollen curriculum yet another subject—that of psychotherapy, at once the newest and the oldest of all methods of treatment! The oldest—for much of the alleviation of illness that we doctors bring about is psychotherapeutical, and always has been; the newest—for it is but yesterday that it became conscious and capable of being brought under law with a technique to be learnt.

The common little illnesses that make up a great part of a doctor's daily round—the headaches, the feelings of being run down, of being tired, the depressions, the dyspepsias, the flabbinesses, the poor nights with broken sleep—are, when he looks back on his hospital days, when the world seemed full of interesting things like tabes, and syringomyelia, and pernicious anæmia, very dull, very depressing for the young graduate. There is nothing to find. He examines his patient carefully and systematically, but though there are no signs of disease there are the possibilities of early phthisis and other states which do not show signs for a long time; and while he does his best to reassure without committing himself, the patient does not get well, and after fair trial goes off to see someone else who has possibly less science but more common sense, and who quickly effects a cure. These common little trifles are very rarely early phthisis, or anything of the kind. Most often they are manifestations of a mild anxiety—they are anxiety neuroses, easily curable in an early stage, but more formidable later; the great care and solemn mien of the young doctor have increased the anxiety, while the other, probably older, man, who has forgotten all his "ologies" long ago, has, in the meantime, learned men and women—has learned how to help human beings. Those who are not cured form the great bulk of the chronic invalids of a practice —the people who are always falling ill, always inefficient, sometimes with symptoms of a grave and anxious character.

These very dull illnesses which at first puzzle the young doctor, and in a very few weeks bore him, and which tend to drag him down into the extremely unscientific person he so often becomes, would, had he only known some elementary psychology, have been of intellectual interest to himself and a source of gratitude on the part of his patient.

And this brings me to the question of what kind of psychology a general practitioner ought to know. But first a word about what he need not be taught very deeply at the outset, and should be discouraged from practising until he has acquired a good deal of experience. I believe that he should be discouraged from practising the clinical methods of Freud, Jung, and Morton Prince—that is, the technique of digging deeply into the unconscious. It is not that these methods have not their value. They have But it is not necessary that they should be used in the sort of cases which a general practitioner will meet with, except very rarely, in his practice. They are in unskilled hands extremely dangerous, and they are also very fascinating. I take it that surgical teachers would discourage general practitioners from removing the Gasserian ganglion on much the same grounds. We shall return to this later.

The psychology that he should be taught thoroughly is that which was taught by Dubois and by Déjerine. He should learn that emotion is followed by physical symptoms. Just as grief is followed by tears, and merriment by laughter, so horror may be followed by vomiting, tremor, giving way of the knees, actual paralysis, or even the unconsciousness which is called fainting; anxiety, remorse, or the like, may have as their symptoms insomnia, headache, palpitation, feelings of fatigue, anorexia, failure of gastric secretion and motility, and therefore dyspepsia and malnutrition; and a long series of effects—organic now—may follow these last.

The student should learn that just as people do not as a rule weep for long, so none of these other emotional reactions would last long but for an intellectual error of which he will be either the abettor or the destroyer. Thus, if the patient thinks that this dyspepsia depends on the kind of food he eats, and the doctor furthers this by doing what Austin Flint long ago called "tinkering with the diet," there will no doubt be early success; but the seed of fear and distrust of particular foods will have been sown, and the harvest of increased fear will be reaped later, and the unhappy patient will in time have a long and increasing list of the foods which he cannot touch. The doctor will have taught fear when he should have taught that there was nothing to fear.

Or, full of the knowledge that this and that histological repair in the brain-cells of exhausted animals takes place during sleep only, he may impress unduly on his patient the paramount importance of sleep, and create in this way an anxiety which is renewed every night on going to bed—the anxiety that, unless sound sleep is obtained, something dreadful will happen—the very anxiety that should have been avoided.

Such a patient should be taught that just as these symptoms are started by some depressing emotion, so they are kept up more often than not, not by that originating emotion, but by the fear that the symptoms are those of disease; he should be instructed that their cure depends on getting rid of this secondary fear.

To prevent frequent repetitions of the symptoms or reactions the originating anxiety should be discovered. When this has been accomplished, free discussion of it may help the patient to get rid of it, or to look at it from a different point of view. In any case, even if nothing can be done for it, the knowledge that some person knows and sympathises is curiously comforting; and courage to face the trouble is more easily acquired. Usually it will be possible to manage that it shall be looked at from a new point of view. An anxiety or a sorrow which is kept secret is usually looked at in one way only.

With examples from the other main functions of the body, this then is the kind of psychology that should be taught to the medical student; but to make the teaching effectual in practice, he must be instructed how to get his patients to believe in him and his doctrine. The belief in the physical origin of disease is so strong that the doctor must learn how he is to approach his patient's mind if he is to get a hearing at all. Unless he can get himself believed in he will do nothing. To the whole tribe of the psycho-analysts this is the rankest sort of heresy. Faith is out of fashion. Analysis and diverting the psychic energy into fresh channels are alone the curative agents. To this the answer is that one knows of many cures which were brought about by faith without analysis, and which have stood the test of years, but one cannot conceive of any analysis being carried out where there was no faith.

We want to teach the doctor how to get at the mind of his patients before the symptoms have become rationalised—become, that is, fixed by reasoning to some external cause, such as the weather, the food they eat, the bracing or relaxing quality of the climate they live in. We want this done before the real cause has slipped into the unconscious or been repressed into it, while it is still conscious, though it may have become mentally dissociated from the symptoms, which are now kept up by the rationalised cause. Our minds are so constituted that we do not like to think that our illnesses are due to our own thoughts or acts. We therefore tend to dissociate our thoughts from our symptoms and to find some external reason for the latter. In this country the weather is certainly the most popular, and it is specially change of weather, no matter which way, that is so potent. As such a change commonly occurs two or three times a day, it is not very difficult to find what is desired.

When the cause has been determined the doctor should be able to help the patient to face it bravely, and then, in most cases without analysis, he will be able to direct the psychic energy without much trouble into more profitable channels; and therefore he should be capable of becoming an agent in promoting for his patient an aim and direction for life. Most of the people who are overwhelmed by the difficulties of life are those who have no ideal to pursue. Such people are found in all classes—in the comfortably off, because they have nearly everything they need; in the poor, because the dull monotony of their tasks has crushed out all idealism.

Students must be taught formally how a sick man should be approached. Jokingly, one who spoke here on another subject said that he supposed a bedside manner had its value. It has; but the bedside manner I should like to see is not very easy to carry out. We do not teach our students how they should acquire the power of getting into proper touch with patients. A most important part of case-taking is getting the history, and a ward is not the best place in which to obtain it. Nothing like a history can be got in the presence of a third person, and the first thing to be done is therefore to endeavour to see the patient alone. Otherwise a full account of even the physical symptoms will not be forthcoming. The patient becomes ashamed of the length of the list. Of psychical causes of symptoms or of psychical symptoms, phobias, obsessions, etc., nothing will be heard. No human being is going to talk of fears, worries, or anxieties in the presence of a nurse or relative.

At present the student sees that the physician always conducts his examinations in public, and he is never told that anything else is desirable; indeed he is sometimes told that if he sees a young woman alone he is running a risk. He may be, but it would be better to teach him that without some risk in this world nothing is accomplished, and he would probably become a better doctor if he were taught that his reputation may be left to take care of itself, if his only thought is his patient's welfare. In private practice the difficulties are to get rid of the mother of a young lady, and apparently also to send a nurse away wherever one is found. Patients are singularly grateful and communicative if a doctor will show himself master enough of a sickroom to turn a nurse out while he talks to them. Here, then, is a definition. A good bedside manner is the art of eliminating third persons without offence.

The history of a neuropath must be listened to unweariedly once, and if this is done, most of the psychical facts necessary for comprehension will be given voluntarily in a large number of cases, and it is easy to teach how others may be asked for. Do students nowadays get instructions to listen? I remember one teacher telling us we might stuff our ears with cotton-wool, and another saying that histories were only misleading. They may mislead if the doctor takes the patient's diagnosis; if because the patient says he has rheumatism the doctor, instead of examining him, gives him salicylate of soda; but, apart from the doctor being hypnotised by the patient in this way, it is essential for the proper comprehension and treatment of that patient that the doctor should know that he thought he had rheumatism.

Needless to say, complete and thorough physical examination is necessary. Not only must the doctor know the physical state of the patient, but the patient must be made to feel that he knows for certain. Extreme thoroughness here cannot be insisted on too much. But in connection with the physical examination let us hope that the belief that small defects in some organ, like the eye, nose, or uterus, cause symptoms of magnitude, will be allowed to die. Such defects have usually been present all a patient's life, and therefore are unlikely to become suddenly causes of symptoms; and though immediate good effects may follow treatment of them, because of hope which is instilled, that hope is founded on a false premiss, and the after-results are bad.

Having complete possession of the physical and psychical facts, the doctor will usually find that the way of cure is the way of common sense.

All this is obvious, but a few words must be said on something that is not so obvious, but about which some view one way or the other must be stated, viz. about psycho-analysis, *i.e.* the exploration of the unconscious. I do not propose to engage in any argument about the question of the existence of the unconscious mind. Anyone who doubts that he represses disagreeable facts so that he becomes unconscious of them and cannot recall them need only analyse a few of his own dreams to get enlightenment. The question is how far is the unconscious the cause of symptoms. Experience teaches that it is so in most cases of long standing of the kind that we have mentioned, and in cases where there are psychical symptoms such as phobias, obsessions, feelings of unreality, etc., but that there is also a large group where the symptoms do not depend on what is really unconscious, in the sense that the causal ideas cannot be elicited by ordinary conversation skilfully conducted. This is the group which the general practitioner should know about and be able to treat. If a case is in, or has lapsed into, the group where the cause of symptoms cannot be so elicited, it will usually be beyond his power to deal with it. The repressed idea or ideas must now be sought for by the exploration of the unconscious. The followers of Freud would have us believe that in all cases it is a repressed unconscious complex of ideas that is the cause of an anxiety neurosis, and further, that this complex is always of a sexual nature, but there appears to be little doubt that both statements are erroneous. With the first I have already dealt; as regards the second, if the analyst starts his analysis intending to find sexual repression, he will find it. The possession of the instinct is normal. It is normal to repress it, therefore it is always there. A sexual memory which has been repressed may cause symptoms, but then it must be shown that it was a real cause, not merely a concomitant circumstance. The thorough Freudian does not care how many other complexes of obvious causal value for the case in hand he unearths. He goes on till he finds the inevitable sexual repression which may be, and likely is, normal, and not the cause of symptoms. In this way much needless distress is caused to the patient. This kind of practice has made the whole subject of psycho-analysis stink in the nostrils of the non-German peoples; but apart from Freud's predilection for this particular point, and for the correlated doctrine of fixed symbols, his technical methods are of the utmost value for the exploration of the unconscious. He postulated that all psychology was individual, and this doctrine seems eminently sound. The interpretation of dreams was held to be the best method of approach to the unconscious, and the events of the dream were symbolic of the repressed thought or complex. A large number of the things that people see in their dreams are common to them all. For example, water is a common constituent of dreams. Now, if all psychology is individual, the symbolic significance of water in a dream will differ for everybody; and in dreams that I have investigated it has had such different significations as going to France and being killed in the war, and the drowning of a patient's brother forty years previously. In each case the explanation fitted the particular trouble. Freud, however, with his infatuation for sexual explanations, made water, along with a host of other things, a sexual symbol always. It is extraordinary that he did not perceive that by doing so he undermined the whole foundation of his psychology; for it rests on the one great conception that because psychology is individual, it is worth investigating. If one may venture to do anything so unscientific as to make a deduction from modern philosophy, this is what one would expect, viz. that our psychology would be individual. The difference between non-life and life lies, according to Bergson, in the fact that the former is strictly subject to mathematical law, and therefore its every action is foreseeable; the other is not, and of it nothing of the future can be foretold. Such a future entails an individual, an unexpected past.

Of the various schools which have sprung from Freud the same may be said; the methods are not for the beginner.

Morton Prince's method of exploring the unconscious by hypnotism is of great scientific interest. He has probably demonstrated the existence of the unconscious mind with more certitude than any other investigator; but the danger of making a patient dependent on his doctor, of making him incapable of standing alone, appears to me to be very considerable. He has been able to show that the unconscious is not forever occupied with the sexual.

But, as has been said, commonly the complex which originated the symptoms is not in the unconscious, though often dissociated from the symptoms; and by careful inquiry, by getting the patient to think back, it can be obtained without the exploration of the unconscious. At the same time, some description of those methods should be given to the student, though he should be told that in general practice they will hardly ever be necessary, and that as the technique is difficult to acquire, and needs much practice, he had better not try them himself.

When should psychology be taught? Not till the student has been grounded in ordinary clinical medicine. Physical symptoms, physical signs, and physical effects must be the first study, or we shall create only a lot of slipshod faith-healers who will lack the enthusiasm of the genuine Christian scientist. And here I would plead for the teaching of more courage in the stating of the physical part of the case. Doctors who make slovenly diagnoses like "weak lungs," D. A. H., and the like are the greatest makers of anxiety neuroses. A doctor should have the courage to say that an organ is healthy or not healthy, or that he does not know. These diagnoses are given for one of two reasons: first, the doctor wishes to have been right whatever happens; but even if the present illness passes, that patient has been led to believe that he has a weak organ, and that therefore he must always take care, and a man who is taking care is ill. The second reason is the desire to save the patient anxiety when he has something grave. I am convinced that a statement of the kind only makes more anxiety. Most people can face open trouble, few trouble that is badly smoothed over. It is not possible to do it well for long.

The whole of these subjects cannot be taught clinically, and as it would be well that some teaching should be given in certain aspects of general psychology such as the effects of habit, the nature of the instincts, etc., a short course of lectures is necessary. I think about twenty might do. If the student has, as I gather, too many lectures already, surely much of the useless information about drugs and most of the practical class of materia medica might be abandoned. Would it be an exaggeration to say that 60 per cent. of what is now taught in that subject by lectures and practical work might be dropped? It is not used in medicine and has no cultural value. Why teach a man how to make pills any more than scalpels?

Finally, my last point was to be whether the young graduate is at present adequately equipped in this subject. There is no sign that he, nor that the profession as a whole, despite the immense literature, is imbued with any real psychological knowledge. When it is, we shall be saved from those public exhibitions of collective folly that we give every few years—exhibitions that show that if the laity are gullible it is nothing as compared with our own gullibility. The profession will not then hail as Heaven-sent panaceas crazes like the sour milk craze, the tuberculin craze, the high-frequency craze, the appendicectomy craze. Till the public also is educated, these epidemics of treatment will occur, but the profession will understand why they wax and why they wane, and its reputable members at any rate will not tumble over one another to bolster them up with pseudo-scientific reasons. We shall be saved from many worthless papers on treatment, and our journals will not be the subjects of amazed comment to the workers in other sciences, as they are at present. We all desire rational medicine. There can be none till the mind—the normal and not only the insane mind—has been studied with that care which has hitherto been bestowed only on the body.

At the outset it was stated that a man with experience, common sense, and little knowledge, might help these patients much more than one who was inexperienced but highly educated. The reason for such occurrence is that faith is, in my belief, the most potent part of cure, and as the disease is not physical no display of physical knowledge helps, whereas the sympathy and kindness engendered from a knowledge of the world does. The question then arises, Does it matter in the least what we do? Why not give liquid electricity, or high frequency, or whatever is the fashion of the day? If it is the fashion of the day it will most probably cure the case. The charlatan is the best doctor.

The reply is that it matters altogether. It is often easy enough to cure any present attack unless it have a very deep-seated cause. But at the next time of stress there will be a relapse, and further treatment will become necessary if the patient was cured by something meaningless just because he happened to believe in it. But the faith which the patient acquires who has been treated by the methods described in this paper leads him to see that the road to cure lies in his own mind, and he will be able in future to travel that road alone and to arrive back in health almost before he had time to fall ill. By psychological knowledge alone can he hope to avoid relapse. And for us, it will be pleasant to stop being indiscriminate druggers and become once more what we always have been desirous of calling ourselves—doctors—teachers of medicine.

XLVII.—THE TEACHING OF PSYCHOLOGY TO MEDICAL UNDERGRADUATES.

By R. D. CLARKSON, Larbert.

FOR a very long time medical teaching has tended to ignore or deny the existence of a *psyche*. Psychology was metaphysical. The mind was the secretion of the brain. All that concerned the work of a medical man could be expressed in terms of matter and motion. The self, the ego, the unifying something that made a congeries of cells, each with its physical and chemical reactions on its environment, into a personality would doubtless some day be reduced to similar terms with the rest. In the meantime it was safe to take no account of it. So that, in 1906, one of the ablest of the Scottish asylum superintendents was expressing the general opinion of the profession and the schools when he wrote: "To talk of ministering to the mind diseased is to talk clap-trap and nonsense. Mental diseases, like other physical disorders, are best dealt with on the lines of common sense and general medicine." Of late years there has been a change in medical opinion, though, so far as one can learn, it has not yet affected teaching. Physiologists have begun to investigate the bodily effects of emotion in the lower animals, and it has been shown that their results apply to man. The effects of mental strain and strong emotion on men engaged in warfare or in flying have been too obvious to be overlooked. Suggestion and hypnotism have been more widely used and have been found capable of producing bodily changes. Child study having become fashionable, the medical profession has been obliged to give some attention to it, and that attention has been increased by the appointment of so many medical officers of schools. Neurologists have become convinced that the prophylaxis of many nervous disorders is only to be attained by the proper rearing and training of neurotic children. Like M. Jourdain, who had talked prose all his life without knowing it, general practitioners have begun to realise that, unconsciously, they have been doing a large part of their work by psychological methods. They have found that in the cure of disease the patient's attitude of mind was all-important, and that courage, hope, and confidence in the doctor were invaluable allies. If some practitioners still take cheap and nasty short-cuts to produce these states of mind; if we still too often hear, when a case recovers, that the doctor was called in just in time, or, if it dies, that the doctor was called in just too late; if we learn that parents have been assured that imbecility would disappear or fits would cease at the magic ages of seven, fourteen, or twenty-one, is it to be wondered at? A medical student who has never been taught that mind exists, or thought over its relation to the body, and who, indeed, has been prevented from such thinking, except for the brief period in which he has studied mental diseases, by the multiplicity of material facts, and fancies relating to them, which he has been compelled to get up, can have no more knowledge of psychology than the man in the street. He is apt, therefore, too often to accept and use for his own purposes the ideas that he finds current on the subject among his patients. This is not for the credit of the profession or the schools.

The only teaching of psychology in the medical curriculum is in the class of psychiatry, and it is to be noted that morbid mental states are the only morbid conditions that a student is asked to study without any previous consideration of the normal. The class is a short one, the number of mental disorders is considerable, and there cannot be time for any proper analysis and description of the normal mind. The cases shown, moreover, have all been certified. Many of them were ill for months before they reached that stage and many have been for long periods in the asylum. By far the greater number were under medical treatment during their preliminary illness. Yet how little do we know of the early stages of mental disease! The study of these early stages is work for the general practitioner and for him alone. Sir James Mackenzie's appeal to the general practitioner as "the only investigator that has the real opportunity" to enlarge our knowledge of diseases of the heart applies with greater force to diseases of the mind. The practitioner cannot begin his research till he knows what he has to observe. If he is left to find out for himself where the gaps in our knowledge are, his time for observation may be too short to be of much use. Study of the present state of our knowledge of the normal mind seems the only way in which the attention of students with aptitude for such work can be directed to it.

Of late years much attention has been given to mental defect. The Mental Deficiency and Lunacy (Scotland) Act, 1913, and the Mental Deficiency Act were passed to deal with a defective class in the community "whose training is neglected, over whom no sufficient control is exercised, and whose wayward and irresponsible lives are productive of crime and misery, of much injury and mischief to themselves and to others, and of much continuous expenditure wasteful to the community and to individual families." The intention of the Acts is to have all such cases recognised in childhood, to have them properly trained so that the most may be made of their limited capabilities, and to have them placed and kept under whatever control is necessary for their own protection or the protection of others. The detection and certification of these cases must be largely the work of general practitioners, and they must receive instruction and study mentally defective cases for themselves if they are to perform it satisfactorily. Every case must be certified by two medical practitioners, of whom one must be approved for the purpose by the General Board of Control. The first list of approved practitioners in Scotland contained 1443 names, and of these only a small proportion had studied mental defect in children. The consequence is that School Boards and Parish Councils are being assured that obvious cases of mental defect are normal or will become normal after ordinary instruction in a primary school. In this way these Boards escape their responsibility for the care and control of the feeble-minded in their areas, and the evils which the Mental Deficiency Act was passed to prevent are certain to be perpetuated. The war has stopped the public provision of institutions and schools for mental defectives by the District Boards of Control, and so has annulled many of the benefits of the Act, but no amount of accommodation will be of any avail until general practitioners can recognise the cases and are prepared to certify them correctly. One example, out of very many, will suffice to illustrate the present state of things. It was reported to one of the largest School Boards in Scotland that a boy was incapable of deriving proper benefit from the instruction in school, and that he was drifting into a career of petty crime and had been twice apprehended by the police. They had the boy examined by two experts, who certified that the boy required to be placed in an institution. The father, convinced, as so many parents are, that his boy was normal, was confirmed in his opinion by four medical practitioners, all of whom certified that they could find no evidence of mental defect. Two of them, writing from the dispensary of a large sick children's hospital, not only certified that the boy was normal, but added that, in their opinion, he would be made worse by association with children more defective than himself. This is a common view among the general public and members of School Boards, and there is not a scrap of evidence for it. If it is not corrected it will lead to an enormous waste of public money. Some Boards, with the approval of their medical officers, already contemplate the establishment of separate institutions for every conceivable grade of mental defect.

Mental defect, occurring in childhood, cannot be studied in an asylum. The cases are not and ought not to be there. It has, therefore, been the custom for the classes of psychiatry in Edinburgh and Glasgow to spend an afternoon in the session at Larbert and to see the cases for themselves. This has been found useful, but the classes are too large and the time too short to make sure that everyone has got such a grasp of the subject as he should have. The problem is a very large and important one. The number of mental defectives in the schools of Scotland is at least 6000, and some authorities estimate it at a much higher figure. It is probable that there are as many mental defectives in need of care and control as there are sufferers from all other forms of mental unsoundness put together.

A properly educated general practitioner then requires a knowledge of the normal mind and of neurotic, neurasthenic, and hysterical conditions for his daily work. He requires a knowledge of the normal development of mind and of the evidence of mental defect to enable him to carry out his duties under the Mental Deficiency Act, and he requires a knowledge of the various forms of mental unsoundness in order to enable him to detect and certify cases of mental disease. He ought to be taught that the hygiene of mind is at least as important as hygiene of body.

So far as the detection and certification of mental disease is concerned, the present course of psychiatry meets the requirements of the student. Its only defect is that it does not provide material for the study of mental disease in its early stages, and that, therefore, students are not made sufficiently aware of the importance and the possibilities of prophylaxis. Every general hospital ought to have a ward or wards devoted to cases of incipient mental diseases, and to borderland cases such as the neurasthenics, and this material should be available to the lecturer on psychiatry for illustration and for practical work in connection with his lectures.

The study of mental defect should be begun by the setting up of some sort of normal standard. In the present state of our knowledge this standard is necessarily vague and unsatisfactory. The mental attainment of every child varies with its age and its opportunities for development, and in his work at the Sick Children's Hospital the student should direct as much attention to the development of mind as he does to the development of the body. Cases of mental defect occur frequently in the hospital, and should be demonstrated and studied as carefully as cases of bodily defect. But when all this is done the standard of normality that gradually forms in the mind of the student is a standard for sick children. If he is to advise parents successfully as to the education and bringing up of their children, and that that should be the work of the medical as much as of the clerical and teaching professions I am firmly convinced, he must see more of normal children and must know more of their average mental development at every year of school age than is possible at present. It ought not to be impossible to arrange for students seeing something of normal children in the schools, and they should study them, not only from the point of view of the school medical officer, who is too often only concerned with their bodily defects, but from the point of view of the teacher. Only by a closer co-operation of the medical and the teaching professions will we be able to build up after the war a race characterised by the possession of sound minds in sound bodies.

Is a knowledge of the development of the mental faculties in childhood and of the defects and diseases of the mind all that a general practitioner requires of psychology? Surely not. Like all students of science, he should at some stage in his career be made to examine the foundations of his belief in the phenomena with which he deals. It will not do to say that there are men with minds so unphilosophical that they could find no profit in such an examination, that for the great majority it suffices to appeal to experience. "The field of experience is no well-defined and protected region under whose clear skies useful knowledge flourishes unchallenged, while the mist-enshrouded territories of its metaphysical neighbours are devastated by unending disputations. On the contrary, it is the very battlefield of philosophy, the cockpit of metaphysics, strewn with abandoned arguments, where every strategic position has been taken and re-taken, to which every school lays formal claim, which every contending system pretends to hold in effective occupation." Every medical student of the human mind should be made to realise this, and, if he is incapable of doing so, he would be wiser to try some less intellectual occupation. A course of lectures on psychology, with for text-books James' *Talks to Teachers on Psychology and Life's Ideals*, M'Dougall's *Social Psychology*, and Drummond's *Introduction to Child Study*, would give a practitioner a broader outlook on the problems that face him in practice and a firmer grasp of the details that must be attended to in the prophylaxis and treatment of nervous disorders.

Such a course should have a place in the medical curriculum. This could be done if a modicum of botany were to be required in the preliminary examination and an examination in psychology were to be substituted for botany in the First Professional. If this were done, more attention would soon be given to the nervous system in the class of physiology, and the present tendency in clinical teaching to ignore the psychology of the patients would be gradually but surely done away.

DISCUSSION.

Dr. Edwin Bramwell.—As regards the ideal method of teaching neurology, I am rather opposed to Dr. Graham Brown's suggestion that the student should begin with a course of physiology, pathology, etc. I think the average student benefits more if one begins by demonstrating clinical conditions to him and making him think about them, and *then* applying the physiology.

Dr. G. Robertson.—I should like to emphasise also the very important part the mind plays in the symptoms that occur in general medicine. This was brought home to me strongly when I was a young graduate and went to France to see what had been done there in hypnotism. In Nancy I saw a patient hypnotised for pneumonia by Dr. Bernard. It struck me as rather a far-fetched proceeding, since pneumonia is a disease of very definite organic foundation ; but Bernard pointed out to me that the symptoms complained of in pneumonia are nearly all mental—discomfort, breathlessness, pain, loss of appetite, sleeplessness. This convinced me that we place the organic material factors of the disease far too prominently before our minds. Even in a surgical case, like whitlow of the finger, the feeling that the patient complains of is purely a mental symptom ; cut the ulnar nerve and he no longer feels any pain.

It is very desirable that mental treatments should be given intentionally and not unconsciously. Bernard's patients suffering from melancholia were given the suggestion that they would get well in a short time, that they would no longer be depressed, and that they would soon be at home with their families. When I came home to Morningside I found that Dr. Clouston said exactly the same things. In the waking state he was giving these suggestions to the patient, without realising that he was giving them treatment at all.

Dr. Fleming.—To take neurology away from practical medicine would be a very serious loss. The general practitioner does not require an elaborate course on neurology, but he wants to be able to recognise simple everyday disease, which instruction he might well receive in a comparatively small number of lectures. But that does not mean that in Edinburgh we should be content with such a course of neurology. There ought also to be a more advanced post-graduate course.

Dr. Henderson (Johns Hopkins Hospital).—In 1912 the psychiatric clinique was started in Johns Hopkins Hospital, and in that clinique the ideal was that we should attempt to get hold of patients in the early stages of various forms of mental disease and of the children in the schools ; in short, really to bring the psychiatric clinique into the life of the community. The clinique is composed of eighty-eight beds, and there are both private and public wards. It is very hard to compare the Edinburgh School and the Johns Hopkins Medical School, because the teaching is so different in every way. For one thing, the Johns Hopkins students have practically all taken an academic course ; they must graduate M.A. or B.A. before they enter the school. Most of the teachers there are more or less specialists. They have whole-time professorships, *i.e.* the professors devote all their time to the development of the teaching in the medical school. On that account it was quite easy to start the psychiatric department, and to combine its working with the general working of the hospital. There is very little systematic or didactic teaching in the medical school, and the result is that the psychiatric department has developed along the lines of clinical teaching. The curriculum is a four-years one, and the men have in their third year a course of instruction in elementary psychology and in general mental disease: of how to set about taking a mental case, or an early case of psychoneurosis, or on dealing with the child. In the fourth year they come into the psychiatric clinique, not only as clerks in the out-patient department; they have a definite place in the wards, where their teaching devolves almost entirely on a responsible physician. They are brought into actual touch with their cases and work them up thoroughly. They have plenty of material there and in the out-patient department. This out-patient clinique is specially brought into connection with the education authorities of Baltimore, who have an understanding with the clinique that they shall send any abnormal children to be examined, to be put into special classes, sent to institutions, or otherwise dealt with. There is no doubt that the development of such a psychiatric clinique does tend to get the people in the community to take an interest in mental disease that they never used to have. It gets the men in the profession to take an interest also in this subject which hitherto they may have lacked. The clinique, without a doubt, helps in the prevention of many cases of mental disease. We can take a case into this clinique without certification of any kind. We have facilities whereby we can get patients to sign a paper that they shall give so many days' notice if they wish to leave, which gives us time to take steps, if necessary, to have them certified and properly dealt with. I speak from three years' experience of this clinique when I say that I am sure that it plays a very necessary part in the well-being of the community.

Dr. Carswell.—The papers read to-night have all interested me intensely. They have formed an excellent combination, throwing light on the whole aspect of the present state of medical thought and formed opinion on questions relating to neurology and psychiatry in a most remarkable way. That formal psychology and practical or applied psychology, in some form other than merely lectures on mental disease, require to be introduced into the medical curriculum cannot be doubted by anybody who has reflected upon the needs of the medical student and who has had practical experience of teaching. It interested me to hear the somewhat hesitating but fairly frank way in which one man would clear out botany and another would clear out materia medica, and so on. *I* was disappointed, perhaps, that Dr. Hart should give anything to medical jurisprudence. I would wholeheartedly clear it out. I think I heard a murmur of absolute disapproval coming from Dr. Robertson when Dr. Hart made that suggestion.

Psychology has proved its position as part of the medical sciences, and how it is to be fitted in is the only question that now remains. Judging from what one sometimes hears at meetings of alienists, you will not find many among them who could be trusted to teach good psychology. I am satisfied that under our present teaching many patients are allowed to become hopelessly insane who, if taken at an early stage, might have been cured.

That the teaching in the Johns Hopkins Hospital is excellent is known to everybody interested in the treatment of the insane and the teaching of psychology. But I may be excused for saying that although Johns Hopkins has done this work on a high scientific level, she cannot claim priority to Scotland. In a humble way, I can say that for ten years I taught men in Glasgow, in wards in which there were fifty patients, where they saw patients who had not been certified. They were taught there the signs of incipient insanity, to distinguish between the kind of patient who could be treated successfully without going to an asylum and the patient who could not, and how to certify a patient. They also got the opportunity, in twos and threes, of visiting patients reported to be insane in their homes, where they saw the whole process of diagnosis. Not only this, but the students were taken to ordinary day schools, where perhaps ten or fifteen backward children were examined for mental treatment—*i.e.* in hospital, home, and school the Glasgow students had the opportunity of regular systematic clinical teaching in the direction practised in the Johns Hopkins Hospital, although there, to be sure, it is carried out more elaborately than in Glasgow. What has been done in Glasgow can be done in Edinburgh, and in London ought to have been done twenty-five years ago. I feel strongly that if mental diseases are to be taught as they ought to be taught, they must be taught in hospitals and in asylums also, and that the students must be brought into direct touch with the patients and the consideration of all the elements that go to form a decision as to whether the patient should be removed or not. I hope we are within sight of the time when we shall have a system of that sort in Edinburgh and in other teaching centres in Scotland and England.

Dr. John Orr.—It seems unnecessary to institute a special course of psychology for students, because few of them will take up the special study of mental disease. But it is essential that students should know something about mental disease in regard to mental deficiency in children. Clouston's personal and intimate method of teaching gave the student a good grasp of the process of examination of mental cases. There is an urgent need in the Infirmary for a large ward where incipient mental disease could be treated and where the students could study the cases at first hand. If the work conducted in Glasgow could be started in Edinburgh, it would be of great advantage to the medical school. If the students had the principles of examination for early mental disease thoroughly inculcated, the recognition of such cases in their work later would be much easier. There is no doubt that at present many early cases which might have been cured are neglected until they become hopeless.

Professor Lorrain Smith.—Our visitors have pointed out to-night a new aspect of the teaching of psychiatry—that of approaching a simple medical case from the psychological side. I was impressed by the account which Dr. Ross gave us of case-taking. At the same time, that a man should hardly be trusted to take a case until he has had some thorough instruction in the psychological problem which was involved in the relationship between himself and the patient, and the patient and the patient's known past history, is a conception which is most difficult to co-ordinate with our old ideas. I confess that I feel this aspect of the question of introducing a more psychological element into the study of all our clinical cases is rather difficult to grasp, because I do not see how the student is to get the requisite training for it, from childhood to adult life. The far-reaching nature of this conception we will have to brood upon before we can incorporate it in our Report.

Dr. Bernard Hart said in reply.—I have been asked for more constructive detail, which, of course, is an obvious necessity before any scheme can be put into actual practice; but I do not feel, at any rate so far as the south is concerned, that the introduction of teaching in psychology has been generally recognised as a necessity. It is true that the experience of the last few years of the war has thrown the matter into a very vivid light and shown that this teaching of psychology is an urgent necessity. But the first thing to be done is to make that need generally recognised in the medical schools before embarking on the constructive detail. Details of that kind are easier to settle after conference or discussion than in an individual paper. A very moderate number of lectures would suffice, but it is, as a practical matter, difficult to condense such a wide field into a short number of lectures. At present I am engaged in teaching in a military hospital where we deal with these subjects. We are having three-months courses, where R.A.M.C. officers come for instruction in shell-shock cases. I give about thirty-five lectures, and generally cover nothing like the ground I ought to. Even the amount necessary for a general practitioner would be difficult to get over in ten lectures, because the great difficulty in practice is that you have got really very little groundwork to go on. It was that I had in mind when talking of the general reform of the curriculum. There is no doubt that if one can get ten to fifteen lecture-demonstrations allowed, a great deal could be done, and those lectures would be of enormous value to every practitioner.

Dr. Carswell criticises my suggestion of handing over methods of certification, and so on, to forensic medicine. The point I had in mind was that one of our great difficulties is to get into the students' heads the fact that certification is essentially a *legal* matter and not a scientific matter. They tend to think that certification has some place in medicine, whereas, strictly speaking, it has none. A case of insanity is a case of mental disease, and the degree for certification is a purely arbitrary point, and is dependent upon such entirely non-medical factors as the patient's income and the nature of his family, and so on. I cordially agree with Dr. Ross as to the importance of impressing upon the student that elaborate procedures like psycho-analyses, in the Freudian sense of the word, are not suitable spheres for his activity. In my practice in London I have often had very grave reason for seeing the importance of this. I also agree with Dr. Ross when he lays stress on the disastrous effects which follow in psycho-neurotic patients after bad diagnosis, such as "weak lungs." The amount of psychoneurosis to be ascribed to doctors who have treated such patients is very large. Especially in war work do we see that. The number of functional defects one sees that have been built up on a diagnosis of "weak lungs" or "weak heart" is astounding.

Dr. Ross said in reply.—I should like to say to Dr. Chalmers Watson that I hope he will not see many more such cases as he spoke of. There is no doubt that the authorities are taking this matter up much more seriously than before. Many more special hospitals are now being equipped. In the hospital in London where I am now we have come to the conclusion that no case must be discharged until he is cured; and by that we mean, if he is to be discharged from the army that he is fit to earn his living. That is a standard which every neurological hospital should definitely accomplish. As regards sending the men back to the army, from a medical point of view it is most unfortunate that that should be done at all. Forsyth put the matter very well some two years ago, when he said that one would not forbid a patient who had suffered from "railway spine" ever to travel again by rail, but neither would one intentionally send a man who had been in a railway collision by a train which one knew was going to have an accident! That is just what we are doing in the army. Although insanity and grave psychasthenia will always have to be treated by specialists, general medicine is full of neurosis; every patient who is ill has some superadded neurosis, and an enormous number of people treated for physical illness are really suffering from neurosis.

XLVIII.—THE TEACHING OF OBSTETRICS TO UNDERGRADUATES.

By Professor Sir J. HALLIDAY CROOM.

Obstetrics, like medicine and surgery, is both a science and an art, and in teaching the subject it must be realised that both are essential. Perhaps the tendency has been to minimise the importance of the science and emphasise that of the art.

Before approaching the actual subject of to-night's conference, one or two questions naturally suggest themselves. Why, for example, has obstetrics only within recent years reached the position which unquestionably its importance demands? Why, again, has the subject so long remained on a plane separate from medicine and surgery? Why has it so long remained in the hands of inferior practitioners—longer than medicine? and lastly, Why was it left to women, and why in the hands of women did it make so little progress? In looking for an explanation it seems that in the final analysis that will be found in the fact that in human history childbirth has always been regarded as a normal process. There is ample proof to the contrary, but the idea was so deeply rooted in men's minds that its eradication has been a very slow though a certain process.

It is not for me to elaborate here the question that labour is no longer a normal function, but I may just mention that 20,000 women die every year from direct or indirect effects of labour, and that we can form no idea of the late or postponed mortality of diseases acquired during pregnancy and the puerperium, and the immense amount of invalidism arising from childbed.

Hundreds of thousands of women flock to hospital for repair of injuries and relief from effects of disease contracted during labour, and 50 per cent. of women bear marks of injury received during labour.

The teaching of midwifery has always held a prominent place in medical study in Edinburgh. I wish to look at the subject from a broad and general point of view, and suggest a practicable ideal in the teaching of midwifery, primarily an ideal in general and, secondarily only, as applicable to Edinburgh at the present time and under existing circumstances. I do not here, of course, refer to gynecology, because its birth, development, and maturity have practically taken place within the last generation. But I should like most emphatically to state that under no circumstances whatever should obstetrics and gynecology be divorced from one another. Gynecology ought ever to form an integral part of the teaching of obstetrics, and they ought to be associated in a combined course. Every accomplished gynecologist must have a clinical knowledge of obstetrics.

In the first place, with regard to the length of the curriculum, it is impossible to attempt the teaching of obstetrics and gynecology in anything less than a winter course, extending, say, from the beginning of October to the beginning of March, exclusive of the Christmas recess. I have had ample experience of what is known as a three-months' course, and there I found it impossible to overtake the two subjects in that length of time, and consequently, for many years, I was in the habit of duplicating my lectures by lecturing in the morning on midwifery and twice or three times a week in the afternoon on gynecology, which almost doubled the course, and extended it very nearly to the length of a winter course.

In the second place, I would like to point out that, in order to overtake the subject of obstetrics, it can with great advantage be divided into two parts. Whether these parts need be continuous or not is a matter of convenience. The first portion should be devoted entirely to purely systematic lectures on the anatomy, physiology, and pathology of obstetrics. No one realises more than I do that the student of to-day is over-lectured, but because systematic lecturing is overdone that is not sufficient reason why it should be abolished. It should only be relegated to its proper place, and that place in obstetrics is in the anatomy, physiology, and pathology of pregnancy. While a considerable amount of surgery and medicine can be learned perhaps as well from books as by teaching, yet obstetrics is a subject which lends itself more to lucid and definite systematic teaching than any subject in the curriculum. Didactic teaching should be concretely illustrated. This may best be accomplished by means of models depicting accurately everything in obstetrics possible of reproduction. I need not enter into details as to what these ought to be—obstetric anatomy, structural changes of all kinds in the uterus from the beginning to the end of pregnancy, attitudes, positions, presentations, mechanism of labour, and so on; and of recent years the adoption of opaque and lantern slides is essential for didactic teaching.

I by no means wish to over-emphasise the importance of didactic teaching. It is indispensable to the teaching of obstetrics as a science, and for the reasons I have just stated must precede and sometimes accompany the teaching of the practical and clinical side of the subject.

The great aim and object must be to avoid repetition as much as possible, and while, of course, the subject of embryology forms no integral part of obstetric teaching—being overtaken by a special teacher in anatomy—yet it must be obvious that there must be a constant reference to this subject, in some form or another, during the lectures. A saving might be accomplished both in anatomy and physiology, although there again it is necessary that the questions of anatomy and physiology, although taught in reference to obstetrics only, must be dealt with in a general way as well. It must be distinctly kept in mind that the student entering on obstetric study is entering on a perfectly new field, and anatomy and physiology must be dealt with in a definite and concrete form as far as they are applicable to obstetrics proper.

In connection with this first half, tutorial teaching is of the utmost value. The teaching of all microscopic work, microscopic demonstrations, and the study of the subject from this aspect, are best undertaken by a competent tutor or assistant. To this I attach very considerable importance. The teaching of small sections in this way is of immense advantage.

The second part of the course should be devoted to obstetrics as an art. By this I mean that the whole question of labour—normal, abnormal, tedious, instrumental, complex—should be undertaken by occasional lectures, demonstrations, and clinical instruction according to the discretion of the teacher. It is my opinion that clinical instruction in the hospital should run concurrently with the second part of the course. I have tried both ways, and I am certain that it goes a very considerable length in adding interest to the course if these two parts are run at the same time. After the student has been thoroughly grounded in the preliminary part, he is quite competent to realise the minutiæ and importance of the clinical section. Systematic lectures, while forming an integral part of the course, would be supplemented by clinical teaching. While I consider the latter all-important, I am of the opinion, however, that, even in connection with the clinical aspects of midwifery, much is to be gained by the student from lectures given from the clinical standpoint of the lecturer's experience.

It cannot be too strongly emphasised that while the student of surgery and medicine sees his hospital cases daily, the student of obstetrics on the other hand has no such advantage. What I claim for the student of obstetrics is that he should come in contact with the routine work of the hospital every day for a certain length of time. Compared to medicine and surgery, of course, the subject is relatively small, and therefore the shorter time will accomplish all that is required.

My opinion is that a month's clinical work at the hospital gives the student all that he really requires to see. For example, he has first of all an opportunity of examining pregnant women daily under the superintendence of a skilled teacher—a touch class. To this I attach the greatest importance. He sees labours conducted in the hospital under competent management. He has an opportunity of seeing several times in the month all the commoner complications, such as the application of forceps, conduct of abortions, eclampsia, premature labour, and so forth. These occur more or less every month. He has, further, an opportunity of seeing in the hospital the various conditions of the puerperium and the conditions of the infant. This I am perfectly certain, from a long experience of it, is essential for every student of obstetrics. He may, if he likes, extend his experience at his discretion, but a month's daily attendance ought to be the irreducible minimum, with the presence there daily of the same teacher if possible.

Furthermore, it must be distinctly kept in view that the function of a school of medicine is not to produce specialists, but general practitioners, and therefore it is of the utmost importance that men should be brought into daily contact as students with the work that they are to pursue in after-life.

My idea, therefore, is this: in order that a student may have an opportunity of studying midwifery systematically and clinically concurrently (because, after all, this is to my mind a very essential feature), some such method as this should be adopted. First of all, I think four months of obstetrics and one month of gynecology makes an absolutely complete course, but I do not think that less would cover the subject. I have no wish to lay down any hard-and-fast rule as to the number of lectures. All I desire to indicate is the relative time given to each of the three departments, namely, systematic teaching, practical and clinical teaching, and gynecology. Speaking, therefore, of obstetrics pure and simple, if it were divided in this way, so that a man might have two months devoted entirely to systematic lectures and two months employed in lectures, demonstrations, and clinical instruction, this would accomplish all that is required. I can anticipate a criticism of this matter, because I can see that my point may be traversed by showing that only a limited number of students can be accommodated at the cliniques during the winter session; that from fifteen to twenty can only be accommodated each month. That, of course, is a matter of arrangement. Obviously it is impossible to undertake all the students in small clinical classes during the session, but this difficulty can be overcome here, as it is elsewhere, by these cliniques being conducted by other members of the staff in succession.

The clinical teaching of midwifery to a class of students is, of course, a development of these days of anæsthesia and asepsis. Before the days of Simpson and Lister such teaching was attended by difficulties and grave risks to the patients. With anæsthesia and due precautions regarding asepsis these difficulties and dangers are now fortunately removed. Hospitals were in those days dangerous institutions, and the clinical teaching was an impossibility.

A very excellent attempt was made to overcome the difficulty of the students by the establishment of the Milne Murray Home. It was ideal in its conception, and could its object have been achieved, it would have been a lasting memorial to the eminent physician after whom the home was called. It was found that during the working session, summer and winter, the students could not be prevailed upon to reside in the home for a month at a time, and the expense was considerable. It was therefore occupied by maternity students only during the recess. The home offered exceptional advantages to students, but its working as a practical method was surrounded by so many difficulties that it ultimately had to be abandoned.

So far as I understand, this conference refers to undergraduates only. As to the special teaching required for post-graduates and those who wish to specialise, that is a different matter altogether, and does not fall to be discussed at present.

Naturally, the teaching of the clinical and practical side of obstetrics can be accomplished satisfactorily only through the medium of a suitably equipped and properly conducted hospital. Such hospitals should be teaching and research institutions in the fullest sense of the term, with obstetric material freely and constantly available, and the staff should consist of teachers only. For the proper utilisation of the hospital material there ought to be a laboratory connected with the hospital where all the necessary investigations—pathological, chemical, and others—could be conducted under the charge of a qualified superintendent. Until this is accomplished the work of the hospital cannot be properly pursued. Incidentally may I remark that this is the clamant need of the hospital here. The reconstruction of the present one has been so often discussed and so often put aside that the hope of a new one, which is so very much needed before the department can ever hope to fulfil all its functions, must, I fear, be relegated to the somewhat distant future.

With regard to extern work a student has two options. Either he can take the cliniques referred to and twelve cases (ten cases really, as two can, of course, be taken in the hospital), or the Medical Council gives him the option of taking twenty cases anywhere he chooses.

While believing that the extern attendance upon midwifery cases is of less importance than the clinical instruction given in a hospital, at the same time it is a branch that must not be neglected. Ten cases carefully demonstrated in hospital are worth fifty cases attended by the student without instruction. Yet I am of opinion that if these extern cases were managed as they ought to be, and carefully recorded, they would be of value in giving the men confidence and experience. My opinion is, further, that each man ought, when he attends these extern cases, be given a case-book in which to record the pulse and temperature daily for ten days, with any remarks about the case that may occur to him, such as the necessity for calling in assistance, and any complication that may occur. As I have just said, the students should be supplied with registers for the purpose, and these books should be handed in and carefully examined along with their other certificates at the time of entering their names for the Final Examination. This system is carefully and thoroughly carried out by the Central Midwives Board for Nurses, and it is of equal if not of more importance that it should be carried out for the students. I am well aware, of course, that irregularity may occur in this as in everything else. Case-books can be made up to order at any time. But if a detailed record of the cases was insisted on, it would impress on the student the importance of this part of his work and with a little superintendence on the part of the hospital medical officers the accuracy of these reports could be easily verified from time to time.

So far as the extern work in the Edinburgh School is concerned, I have shown in evidence before a conjoint Board of the Royal Maternity Hospital and the Medical Faculty that there are ample cases in Edinburgh to supply material for the whole of the students were the work spread over the whole session, and I do not propose to go into the figures again to-night, as they have no bearing upon the question. But I would just like to say that from my point of view it is immaterial where a student gets his extern midwifery. It has long been a recognised habit among the students in Edinburgh that they should go somewhere during the summer vacation by way of a holiday, say to Dublin, Bristol, or Liverpool, and have their extern cases there. I offer no objection to this whatever, nor can I see how in any way it is a disadvantage. My opinion, however, has been traversed by the Dean of the Faculty of Medicine, who points out to me that it is a flaw in the curriculum that students remain under the impression that they cannot get their proper number of extern cases in Edinburgh, and that fathers and guardians of these students often write to the Dean to express their disappointment that the complete course of midwifery is not available in the city of Edinburgh. Now this is quite a mistake. Edinburgh can supply the needs of all the students if only the work were properly systematised. But it must be obvious to anyone that it is impracticable to expect students to attend extern midwifery during the period of their winter study or summer classes, and it must be, and always will be, the case that men will take this irregular work during their vacation period. Any student can get the number of cases he requires if he chooses to suit himself to the circumstances, but that would necessitate a certain number taking out their extern cases during the time they are attending other classes, and this they find interferes so much with their work that they prefer to go elsewhere during the vacation. Neither this hospital nor any other that I know of can supply sufficient cases in three months for 150 to 170 students. Therefore, so long as we can give those who desire to remain in Edinburgh a sufficient number of extern cases that is all that is required of us. There is no reason why those who desire it and can afford it should not go to other centres for their education in this particular department if it best suits their convenience.

This is the common experience of every hospital in the kingdom, and the reason why the other hospitals are able to accommodate our students is because their own clientele of students is relatively so small. So long as we can offer to students who really wish to take their complete course here the adequate number of cases, no fault can be found with other men who have the means and who take their cases elsewhere. It seems to me we entirely amplify our bargain, and further, the Medical Council is quite contented with twenty cases attended anywhere the student chooses to take them.

To bring the matter to a conclusion, my ideal is that midwifery should be taught in two definite and distinct parts. First, the scientific part, which is overtaken by daily systematic lectures with the aid of tutorial demonstrations on models, diagrams, and microscopic work. Secondly, a practical and clinical part, which is conducted by occasional lectures, demonstrations, and clinical lectures in the class-room and in the hospital.

Concurrently with this second portion there should be daily instruction in the hospital. First of all, in touch work, which is of the utmost importance; secondly, in normal labour; thirdly, in the various abnormal conditions of labour and the puerperium, including instrumental work with forceps; fourthly, laboratory work, where specimens are examined and chemical work done; and finally, for the sake of experience and giving confidence, the students should attend a certain limited number of extern cases under the circumstances I have defined.

In all suggestions for the advancement and effectiveness of the department of obstetrics it must always be borne in mind *qui va piano, va sano; qui va sano va lontano.*

XLIX.—THE TEACHING OF GYNECOLOGY TO UNDERGRADUATES.

By A. H. F. BARBOUR, M.D., F.R.C.P.

By this we understand, how is the university to turn out a graduate qualified to deal in practice with the diseases of women.

Gynecology is a subject in which the general practitioner should be efficient, as in midwifery. For a patient expects, and reasonably expects, to be treated for a gynecological condition in the first instance by the physician who attended her at her confinement, and it is for him to say when she should pass beyond his care. (I use the "him" and "his" in the sense of *homo*, not *vir*, because women now take their place alongside of men in their training by the university.) The examination of the patient is at first in his hands; the diagnosis of her condition, provided he is competent to make one, rests with him; and the routine treatment of ordinary cases—what is described as "minor gynecology"—belongs to him. The general practitioner, however ignorance renders him inadequate, is a gynecologist in spite of himself. He must at least profess to be able to deal with the diseases of women. If he is not able, then he comes gradually to camouflage incompetency with quackery.

The importance of an adequate knowledge of gynecology—adequate, I mean, for general practice—has only of recent years been recognised. How this is to be secured is a question peculiarly pertinent to the Edinburgh Medical School. That the graduate be competent in gynecology as in obstetrics should be the concern of a school which lays claim to the founder of modern gynecology in Britain as it does to the first Chair of Midwifery.

How is the undergraduate to be taught gynecology, systematic and clinical? To answer this question we must first inquire what has been done during recent years, and then what should be aimed at.

In the time of my predecessor there was a systematic lecture on gynecology once a week in the course of midwifery and diseases of women. In the Royal Infirmary clinical teaching was given to large cliniques as part of the teaching in clinical medicine, while every sixth lecture in the clinical medicine theatre was on a gynecological subject. In the clinical medicine examination of the Final, a gynecological case was given to every sixth candidate by lot. That is to say, gynecology was in the systematic teaching linked up with obstetrics—a very important relationship when we consider how close the connection is between the subjects in practice. In clinical teaching it was linked up with medicine, a no less significant relationship when we remember that gynecology deals with one of the several systems into which the female economy may be divided. No handling of a gynecological case can be adequate which does not recognise this fact. Disturbances of the reproductive system are closely related to those of the circulatory and digestive, and especially of the nervous, system, and we occasionally see a gynecological condition dominating the whole female economy. *Propter ovarium est mulier:* and while the discussion of the relation of the function of the normal ovary to the individual belongs rather to the physiologist and the psychologist, the gynecologist has a good deal to say in cases of disturbances of its function. So much for gynecological teaching in Edinburgh up to fifteen years ago.

When the work of the Chair of Midwifery and Diseases of Women was divided, the connection between obstetrics and gynecology was maintained, but the lectures in gynecology were made consecutive—a great advantage to the student. In the clinical teaching the extra-mural ward was placed on the same footing as that of the university: the two wards were united in a gynecological department independent of the medical and surgical sides of the Royal Infirmary. Limited cliniques with a course of five weeks' duration were introduced. Gynecology took its place alongside of medicine and surgery in the clinical examinations of the Final. So much for gynecological teaching as we find it to-day.

Before considering its aims and how these may be attained, let me mention in passing some considerations applicable to other subjects also. In the class-room the student's mind should be present with his body. He cannot tackle a new subject when he is thinking of another made more urgent by a Professional in prospect in which he has previously failed. To sit in a class under these conditions is a waste of time. Then, given a mind at leisure, attention will be stimulated if work done in the class lightens the Professional in prospect. The class examination in gynecology is a more adequate test of a candidate's knowledge than the single question set in the Professional. A student who has obtained over 60 per cent. in the class should be exempted from the written in the Professional: he will have to appear for an oral examination. To get over the difficulty of a possible inequality in the standard of non-university qualifying classes as compared with the university class, the extern examiner might sample the class examination papers of the extra-mural and those of the university class. This will mean no more work for him than reading examination papers for the Professional as at present. If this suggestion were carried out, it would still be necessary to have a written Professional examination for candidates who had not obtained 60 per cent. in the class, and also to determine honours. The record of previous work might also come into the clinical examination in gynecology, as I shall indicate immediately. Before the exigencies of war-time had affected work in the ward, I used to have a record before me of the candidate's percentage in the systematic class examination, of his attendances at cliniques, of the cases he had taken in the ward, which influenced my decision in the case of doubtful candidates.

So much for some preliminary considerations. We have now to ask what is aimed at in gynecological teaching and how this is to be attained.

And first, what should be the character of the university lectures? I use that term rather than systematic lectures, for to give in the compass of twenty lectures a systematic course in gynecology, medical and surgical, is manifestly impossible. The remarkable development of operative gynecology during the last thirty years, as evidenced by the text-books in that subject, would demand a much longer course. Nor is this required if the aim is to turn out a graduate qualified to deal in practice with the diseases of women.

The university lectures are a preparation for the clinical instruction which is to follow, and should lead up to it. They are like a course in the building of the Temple of Æsculapius, resting on the pillars of anatomy, physiology, and pathology, and supporting the dome of clinical work. Let me point out how these lectures can be made of use to the student. The first essential is diagnosis. In diagnosis he has to learn first the normal, and then pass to the abnormal. The form, size, consistence, and position of normal structures, and these as modified by pathological conditions—in fact, all that can be recognised by the sense of touch—enter so largely into gynecological diagnosis that the study of specimens is invaluable, supplemented by drawings of frozen sections which represent relations of parts as they are found in the living subject. The lectures should, therefore, take the form, as far as possible, of demonstrations giving a basis for the clinical work which is to follow. Full note-taking should be discouraged, and can be relieved by a carefully prepared *précis* of the subject in hand or figures of specimens with a descriptive note. The reading of the student requires to be directed. The difficulty in reading for the student is that any text-book worth the name gives more than he requires at the time—more than he has time to read. He needs to be told what to miss as well as what to master. The principles of gynecological treatment must also be given in these lectures, because the clinical teaching is, as we shall see, largely taken up with physical diagnosis. A brief account of the more important operations is necessary to enable the student to follow these when he sees them in the theatre.

These university lectures must be given before the clinical work of the final year, and, from the close connection that exists between gynecology and obstetrics, they may be treated as part of a combined course. To cover the ground, not less than twenty lectures or demonstrations are necessary.

Passing now to clinical teaching, this can only be carried on in cliniques limited to ten or, at most, twelve members, and this in the interest alike of patient and of student. The delicacy and difficulties incident to gynecological examination make it desirable that not more than four students be present in the case of an out-patient clinique or at a dispensary—I speak from fifteen years' experience of dispensary teaching. To increase the number is to lessen the effectiveness of the teaching. In the clinique room of the hospital ward, where the patient is usually under an anæsthetic, the number may be increased to ten or twelve. But this should not be exceeded in the interest of the student, and for this reason: while in surgery and medicine a considerable number of students may be taught from one case, in gynecology each case serves for the instruction of only two students, or, if the patient be under anæsthesia, of only four, as only that number can examine the patient. I use the term instruction advisedly—instruction in the sense of building up knowledge. It is only the student examining the case who profits. The group gathered round the patient are like a company standing round a dinner-table set with a cover for one. They stand and discuss the menu; only he who sits at the table is fed. That each man may have his turn in an hour, the number should be restricted to ten. Given two wards, which is all the provision at present made for gynecology in our Royal Infirmary, it is a simple calculation how short the course must be to overtake the number of students in the final year, due regard being paid to fitting in this with other special courses. Five weeks have been found to be all that can be given, which means twenty to twenty-five meetings of the clinique, the number depending partly on the amount of material. As these cliniques, held in the morning at ten o'clock, have to run over a considerable period of the year, I would ask the forbearance of my colleagues, who are handling large numbers of students and for a longer period, if the few students—few because only a certain number of the twenty will be working under any given colleague—who happen to be attending the gynecological cliniques are absent from their wards during these five weeks.

How can these five weeks be made the most of for the student, and by whom should the teaching be done?

Hospital training is only a preliminary to practice in which the graduate has to teach himself. The aim of hospital work is to start the student on the right lines for instructing himself afterwards. Here, as in all cases of practical work, what is required is to place the tools—in this case the methods of diagnosis—in the hand of the apprentice, and show him how to use them. The initial difficulties are greater in the case of gynecology than of either medicine or surgery, and unless these are got over in hospital work, the graduate will never learn in practice. I need not dwell on these, as they are obvious: the delicacy of the investigation under all circumstances, the difficulties due to the sensitiveness or nervousness of the individual patient, the necessity in the first instance of gaining the confidence of the patient, which is more prominent here than in medical or surgical work.

In the limited clinique the student has to be taught first the normal—for example, the position, form, size, and mobility of the uterus as recognised on bimanual examination—in order that he may be able to detect the abnormal. Once he has literally grasped that, he can go on to the abnormal. This teaching should be carried out by the experienced gynecologist, not relegated to the tutor, as may be done in medicine. And for two reasons: in the interest of the patient, as examination is always a delicate matter, and in the case of a nervous patient may be difficult; and in the interest of the student, that he may learn from that one examination as much as may be taught by one of experience. In the taking of the history the aid of the gynecological tutor comes in. Every member of the clinique should take at least two cases under his supervision; in doing which the tutor will have an opportunity of discussing with him the significance of symptoms and draw his attention to the salient points in the history of a gynecological condition as this differs from a medical or surgical one. I lay special emphasis on this, because, with the patient under anæsthesia, there is no time to read and discuss a history at the clinique: attention has to be concentrated on the examination and physical diagnosis. Such records, carefully taken under supervision, will form an important part of the clinical instruction, and might be taken into account in adjudicating on the candidate's position in the Final Examination.

The problem in a large school like ours is how to make the most of the available material. With the increase in the number of students, due to the influx of women, it becomes increasingly difficult. As things are at present, a few of our students seek their clinical instruction in gynecology elsewhere.

I have not referred to the importance of gynecological teaching on out-patients which might be used to supplement that in the wards, and has this special value, that the student sees the minor cases and the chronic ones which will form the bulk of his practice afterwards. Gynecological teaching at the dispensaries has also proved a useful adjunct in Edinburgh in the past, but, while perhaps the best training for practice, it has only been used by, and is only available for, a few students who are keen on gynecology.

Some may ask whether the undergraduate can by five weeks' clinical instruction be qualified to deal in practice with the diseases of women. A six or eight weeks' course, or extending the clinique to an hour and a half, would certainly be much better, and Edinburgh should lead the way in giving gynecology its right place. Under the existing conditions of the curriculum, five weeks is all that can be obtained, and I have endeavoured to show how this too short period should put the undergraduate in a position, as regards physical diagnosis, to educate himself afterwards in practice—given intelligence on his part. The intelligent practitioner—gynecologically intelligent—is the man who knows that diagnosis comes first—comes before treatment; who knows in certain cases to say with confidence to his patient, "Madam, there is nothing the matter with you," and in others to say to himself, "This is a case I am not competent to deal with"; who knows, in a suspicious case of cancer, to pass it on to the expert for certain diagnosis and early operation; who knows, in a suspected case of extra-uterine gestation, that life will be saved by immediate operation. And the intelligent practitioner knows what he does not know.

L.—THE TEACHING OF OBSTETRICS AND GYNECOLOGY TO UNDERGRADUATES.

By F. W. N. HAULTAIN, M.D., F.R.C.P.

MIDWIFERY has been aptly and very truly termed the keystone of medical practice, and occupies a position of equal importance with medicine and surgery. It differs, however, from these subjects, in so far as teaching is concerned, in two points: Firstly. It is smaller and more concise and can be fully taught, so far as theory is concerned, in one winter course. Secondly. The knowledge of the entire subject must be so acquired by the student that it is both metaphorically and practically at his finger ends.

Medicine and surgery are so vast that only a general and comparatively superficial knowledge of the subjects can be taught, but fortunately more is not essential, as almost in every case, if difficulties arise, there is time for reading and investigation and consultation, without seriously menacing the welfare of the patient. In midwifery, on the other hand, complications arise which demand immediate and competent treatment, if a fatal issue is to be avoided. Midwifery training must therefore be thorough and complete, both theoretically and clinically.

Under existing conditions, the teaching of midwifery in Edinburgh is far from satisfactory—indeed it remains as it was forty years ago, when I first studied medicine. No progress has been made as in the other final subjects, and revision is clamantly called for. So far as the theory is concerned, 100 lectures for the combined subjects of midwifery and gynecology are required and absolutely necessary—a fair division being seventy-five midwifery and twenty-five gynecology lectures. With fewer midwifery lectures it cannot be completely taught, as it is essential that the whole subject must be traversed and thoroughly explained.

It is, however, the clinical teaching that is by far the most important and which is so woefully deficient. It consists at present—firstly, of attendance at the Maternity Hospital for a month, where at a certain hour cliniques are given by the physician in charge, and secondly, the personal attendance on twelve confinements at their own homes.

I need hardly point out that from the uncertain nature of cases of midwifery it is quite a possibility that a student might attend at a certain hour regularly for a month and during that time not see a single case of actual labour, and it is impossible that he can see a case in its entirety. To go round the wards and have lectures delivered on patients lying in bed who have suffered from complicated confinements is not clinical teaching.

The essential of clinical midwifery is to see and follow the actual case in progress, observe how it is managed in a capable way, and there gain experience which is invaluable and otherwise impossible to acquire. To do this the student must be resident in the hospital for at least a month, ready to be called at any hour, day or night, as cases arise, and follow them subsequently at the daily visit of the physician in charge. He should also during his stay conduct at least three cases under the direct supervision of the resident doctor, and by this means become conversant with the management of normal cases. Having done so, it ought to be unnecessary for him to attend more than three cases at their own homes. To conduct under direct supervision or see one case conducted properly, is, in my opinion, worth more than attendance on 100 cases by a student whose only knowledge has been acquired from lectures, who, in fear and trembling, waits anxiously and Micawber-like at a patient's bedside for the fœtus to turn up and enthusiastically welcomes its timely arrival, as he would an old friend or relative who has crossed the seas subjected to the risks of U-boats and mines, of which he has read but has no idea of combating.

But further, by residing in the hospital the student has the opportunity of seeing the management of complicated cases, which is the very essence of midwifery teaching. In the practice of midwifery abnormal and complicated cases are rare, but it is for their efficient management that medical men are asked to attend. If all confinements were normal, the attendance of doctors would not be called for; anyone with a knowledge of cleanliness is competent to wait till a normal case is delivered. In a normal case a doctor is only an interested spectator, but is engaged to be present in case of any complication, which may roughly be said to occur in under 10 per cent. of cases. It is therefore abnormalities that the student should specially see and gain confidence in, and it is only by residence in a hospital that this can be acquired. Such being the case, one naturally asks, Is such training practicable in our school? This can at once be answered in the affirmative. Connected with the hospital there is a residency where twenty students can be accommodated, and which, indeed, was twelve years ago actually in use, but for some unknown reason was shut up—probably because residency was only optional.

In nearly every medical school a residency is in existence and largely taken advantage of by numbers of our own students who are attracted to them. In like manner, doubtless, students from other schools would be attracted to our maternity clinique and reciprocal advantages thus secured.

It is a pity (to say the least) to think that while so many of our students go to other schools, such as Dublin, Manchester, and Glasgow, for their clinical midwifery, we have nothing of a similar nature to offer to attract their students to us.

Compulsory residence in a maternity hospital would not interfere to any great extent with the student's attendance on his other classes. When there is nothing doing in the hospital he is free to go where he wishes. He might, perhaps, in his month's residency be absent from half a dozen lectures without any great loss. Before being admitted to the residency it is essential the student must have a practical working knowledge of the subject. To meet this, I would suggest a short practical optional course of twenty-five lectures in the fourth summer, given by the university assistant, for which a guinea might be charged. After attendance on these he is free to take the clinical month at any convenient time before, during, or after the ordinary midwifery lecture course. By such means he will be able to appreciate the value of the clinical material he sees, and take full advantage of the cases presented.

Gynecology and its teaching is of very minor importance in comparison with midwifery. It ranks with the diseases of the eye, ear, and throat, as mainly a speciality. In detail it is a highly specialised branch of surgery, which it is absurd to ask the average student, with his already overcrowded curriculum, to have more than a general knowledge of. This can be efficiently attained, so far as necessary, by a course of twenty-five lectures, and clinical instruction in vaginal examination extending over six to eight meetings.

That he should have a special clinical examination in this subject any more than in ophthalmology, laryngology, or insanity seems unnecessary, when one considers the very limited opportunity he can have in a large school such as this in acquiring clinical instruction of more than a very rudimentary nature, as it is, without doubt, the most difficult subject to teach clinically to large numbers, if the finer feelings of our women are to be considered. That it should therefore be hall-marked by a special examination seems to me to be merely a waste of valuable time to student and examiner alike.

I should further like to say that I consider that our university authorities made an error when they separated the teaching of gynecology from midwifery. The two subjects are intimately associated with each other. The foundation and essence of gynecology are its obstetric bearings. The causes of most of the conditions and their relations to present, past, and future pregnancies are ever present, and must be more efficiently dealt with by one teacher where continuity and sequence can be maintained.

But apart from this, a much more serious and important question arises, viz. its future effect on the Chair of Midwifery. By having removed gynecology with its associated hospital wards from the Midwifery Chair, there has practically been removed any chance of attracting any eminent teacher of obstetrics from other schools. There is no such person existing as a pure obstetrician. If there ever has been such, he is now as extinct as the dodo.

The practice of the subject alone does not afford a living wage. The bulk of the obstetrician's income is derived from gynecology, and one cannot expect anyone to be attracted to the chair shorn of its gynecological wards, through which he can alone gain a connection with the surrounding medical profession and thus keep himself in a manner befitting his position. Under existing conditions, candidates for the chair must therefore be confined to local gynecologists, who are forbidden to teach the subject by which they have made their reputation and are making their livelihood—surely an anomaly!

Unless, therefore, some generous donor be found who will endow the Chair of Obstetrics and make it independent of gynecological practice, it seems to me essential for the good of the school that the subjects of midwifery and gynecology be combined and given by the same teacher, who shall, as before, have gynecological wards in the Infirmary at his disposal. By this means alone can we hope to attract men of eminence to the chair, and maintain it in the high position it has for so long occupied.

LI.—REASONS FOR THE PRESENT DEFECTIVE EDUCATION IN OBSTETRICS, WITH SUGGESTED REMEDIES.

By E. HASTINGS TWEEDY, Professor of Obstetrics, Royal College of Surgeons in Ireland, Dublin.

THOSE acquainted with the requirements of general practice will not deny that the modern education in obstetrics enjoyed by the medical student fails to procure for the community at large even a moderate degree of safety. This is a serious indictment which I have endeavoured to place on record without exaggeration, for it affects in a very vital manner the future health of the community. The opportunities afforded the trained practitioner in combating death and permanent disablements in the case of infants and their mothers are greater than those possible for the rest of human beings. The present-day destruction of maternal and infantile life is an economic loss of the first magnitude and one which vitally affects the honour of our profession, for its most potent cause lies in the inadequate knowledge of the obstetrical attendant.

For defective obstetrical training I hold three factors responsible: 1st. The bodies who direct the medical student's education; 2nd. The medical student, and 3rd. The maternity clinics. Of these the first is the most important and should be given primary consideration.

The gentlemen forming these bodies are as a rule consultants and anatomical specialists. They are out of touch with the needs of general practice, and they cannot divorce from their minds the notion that obstetrics is after all but a small branch of general medicine, knowledge of which can be easily acquired by any well-educated surgeon in a comparatively short time. They think it can be learned by listening to a course of lectures delivered in the medical school and by the observation of a certain ritual in the conduct of a number of normal cases. Some hold that the student must have his name entered on the books of a maternity clinic for a named number of weeks, and a few go further in actually requiring thirty attendances at a special maternity institution, thereby giving a sanction as to the number considered sufficient to perfect a man in his art.

It must be emphatically stated that no man who has attended a maternity institute only thirty times could be sufficiently trained in the most moderate requirements constituting a "safe practitioner." Again the fact must be insisted on that the average man cannot perfect his art in private practice. Private practice for the most part habituates him to short-cuts and easier methods which enable him to muddle through many difficulties in a manner which seems fairly satisfactory, but which those of wider experience have proved to be dangerous or harmful.

In the second place, the student's responsibility is evident, but his shortcomings may be palliated. From the first he gauges the degree of amused tolerance entertained by his surgical teachers for the obstetrical art. He learns from his senior friends of the discomforts and degradations through which he must pass during his attendance on the practical obstetrical course. He understands that he must go through a certain procedure in a given number of confinements to entitle him to name them as conductions. For these cases he is in competition with untrained and often ignorant probationer midwives, and at times must find himself subordinate to and under the orders of the midwife. He is told that this course is of no assistance in enabling him to answer questions for his Final Examination, and he learns of many valuable expedients whereby he can evade it. He also notes that there is no provision made as to the period for taking out his course, and if he is to prevent it clashing with his general hospital or other important specialities, he must forego his vacation and work at it throughout his holidays. It is clear that, with such difficulties besetting his path, the average man cannot view the course in any other light than that of a disagreeable necessity, to be evaded or scamped by every art of deception.

Thirdly, the maternity clinics must also be held to blame. These institutions are often undermanned and are in the hands of short-time officers who themselves possess little more knowledge than the students whom they instruct. Moreover, the more lax these institutions are, and the less supervision they enforce, the more popular they become with the student. The latter is often pleased to receive a certificate of full attendance when in reality his name has only been entered on the books for the time specified. It is a regrettable fact that the maternity which tries to enforce a strict attendance and a scientific teaching is apt to lose its popularity, and its students transfer their patronage to some more worldly-wise, if less scrupulous, competitor.

Suggested Remedies.—Improvement in the students' knowledge will only occur when the teaching bodies discover that the art of obstetrics is a very difficult one to learn and that it cannot be acquired in a shorter period than a six months' course of close attention to a maternity institute. A register of such attendance should be kept and the proportion of attendances should not fall short of that required for the general hospital. Further, there must be no clashing between the hours of attendance in the general hospital and the maternity clinic. The clinics should be subject to close inspection, and strict attendance and attention to work must be insisted upon. The compulsory conduct of a specified number of confinements should be abolished. It is no more reasonable to insist on this than it would be to gauge the efficiency of a surgical student in accordance with the number of ulcerated legs he had dressed. The present plan of permitting junior students to attend cases without supervision should be abolished. A student should not be permitted to enter for his Final Examination who cannot show evidence of being present at the attendance of a certain number of abnormal deliveries, of which two should be forceps deliveries.

In reference to some of these suggested improvements it may be objected that a six months' practical course, honestly carried out as above described, would be too great an inroad on the present medical curriculum and would tax too heavily the time at the students' disposal. My answer is, that it would make a very serious change in the practical education of the student, but such change is a necessity and a minimum demand.

In the Rotunda Hospital the extern maternity assistants are selected from men who have undergone such a course, yet the practical efficiency of the junior falls far short of that possessed by the senior extern assistant. Again, the assistant masters are chosen from amongst the extern maternity assistants, and they, at the end of their term, are, without exception, more skilled practical obstetricians than the junior officers. Indeed the experience gained in this hospital shows that the good effects of practical work are more evident than in any other branch of surgery or medicine. It is because of this knowledge that I plead with all my power for a six months' course of practical instruction. It seems to me that such a course could be made easy if men were compelled to take out their general hospital course during their second, third, and fifth years, whilst the fourth year should be left for the study of the different specialities. The examination in obstetrics and gynecology could be completed at the end of the fourth year, and with this important subject out of the way the student could then devote his entire energies to the perfecting of his practical knowledge in surgery and medicine.

Finally, in respect to the obstetrical and gynecological examination, there is at present too large a proportion of marks allotted to the clinical act. The clinical examination of necessity must be a restricted one and the student can very easily master the practical details which will enable him to obtain high marks. This high percentage is sometimes sufficient to counterbalance poor scoring on his paper and in his *vivâ voce*, and may make his total marks amount to a qualifying percentage.

LII.—CLINICAL TEACHING IN MIDWIFERY AND DISEASES OF WOMEN.

By J. S. FAIRBAIRN, F.R.C.P., F.R.C.S., London.

I PROPOSE to discuss how we can best fit the student for the general practice of medicine by the teaching we give him in midwifery and the diseases of women. I do not intend to consider advanced teaching or research work.

A revolution in the teaching of practical midwifery was effected by the recommendations issued by the General Medical Council in 1906,* as the result of a special report by a committee presided over by Sir John Williams. That report marks an epoch in that it put an end to those bad old days when the student, fortified by a smattering of anatomy, physiology, organic chemistry, and the cognate sciences, sallied forth into an out-door maternity district to pick up, or not pick up, as the case might be, the practice of midwifery.

There were two essential points in these recommendations—(1) That every student before commencing the study of practical midwifery should have held the office of clinical medical clerk and surgical dresser. (2) That he should have had adequate indoor instruction in the conduct of labour before attending extern cases.

These recommendations are so obvious that we can but marvel that they were needed as recently as twelve years ago. Until the student has been taught the methods of general medicine and surgery he cannot apply them to the special conditions of maternity practice. If percussion is not often required, inspection, palpation, and auscultation are essential to the investigation of every midwifery case, and it is clearly an advantage that the student should know when a patient is ill, what may be learnt from the pulse, and how to test the urine. The most important lesson the student learns while devilling for th surgeon in the operating theatre is not the details of operations he will rarely be called on to perform, but the thorough drill in the technique of surgical cleanliness which he will apply every day in his midwifery practice. Yet pressure from the General Medical Council was necessary before the examining bodies responsible for the training to be given to the general practitioners of the country could be made to insist on the surgeon teaching the student the technique to be applied in his maternity work before, and not after, that work had been done. The second point, that the practice of midwifery should be first taught within a hospital, like the practice of medicine and surgery, is too evident to call for discussion.

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* Report in *British Medical Journal Supplement*, 8th December 1906, p. 316.

Taking these recommendations as representing the irreducible minimum in the teaching of practical midwifery, I would urge that the clinical study of the diseases of women should be carried on at the same time. Midwifery, as the study of the normal and abnormal processes of reproduction, should go hand in hand with the study of the diseases of the organs concerned in reproduction, especially as so many of these diseases—the infective and mechanical lesions, for instance—are the immediate result of abortion or labour. For this reason the tendency, more marked in America than in this country, to make gynecology a branch of general surgery, and to advocate its divorce from midwifery seems to me a retrograde move so far as the training of practitioners in general medical practice is concerned. Professors of gynecology, who disclaim any special knowledge of midwifery, may be excellent abdominal surgeons, may add greatly to our knowledge of the subject and stimulate research, but my point is that they are not the teachers to train the general practitioner-to-be. I would rather retrace our steps and go back, if not to "Professors of Midwifery and the Diseases of Women and Children," to an understanding that midwifery should not end when the infant begins its separate existence. This I urge, not with the view to taking the diseases of infancy back from the physician for diseases of children, but in the hope that something may be done to prevent the infant having need of his services.

I would like to see separate courses of systematic lectures given up for a single course comprising both midwifery and the diseases of women; it would save much needless repetition and give a wider and broader outlook to the student. Cause and effect would be considered together—labour and abortion in the production of pelvic disturbance, and pelvic disease in the production of sterility, abortion, or abnormal reproduction in any form.

Many debatable questions as to where to include extra-uterine gestation, the pelvic puerperal infections, and the results of injuries during parturition would be settled by taking them in their logical sequence, and the teaching of both the obstetrical side and the gynecological side would be made much more impressive. So also the clinical observation of the organs in the pregnant and non-pregnant state, learning how to avoid, and seeing the consequences of, the injuries, infections, and complications of childbed, and generally absorbing at one and the same time the physiological and pathological processes of reproduction will give the student a far more accurate perspective than if midwifery is done one year and the diseases of women the next. Moreover, the simultaneous practical study of the two branches of the subject, especially if under the same teachers, will help to foster that preventive bent of mind towards all abnormal processes, which is the attitude we must aim at producing.

It is the development in the student of what I may term "the preventive bent" that I would make the chief motive of this paper, because I think that in teaching the practice of midwifery we have special opportunities that should not be missed. The trend towards the preventive side in medicine has now reached a stage which makes it incumbent on the teachers in all the later subjects of the curriculum to assist the movement. It is not a simple matter, because it is difficult to give the necessary object-lessons, and naturally the student's attention is much more attracted by cases of serious and unusual disease, especially if they have dramatic and startling accompaniments, than by the less striking investigation for the causes of possible trouble to come.

Attendance on the conduct of labour in the maternity hospital and the extern district is not sufficient; the other machinery, of what is termed "a maternity centre," must be used in the teaching and must be made compulsory. The clinics for watching the pregnant women and the mother and infant afterwards, with home visiting and other social organisations, must, together with the hospital, be made a model scheme and a practical demonstration of prevention applied to a section of the community. The improvement of the health and physique of the nation must begin from the start of life—from birth or even from conception — and we midwifery teachers are responsible for the time when preventive work originates.

We can illustrate, by the care of the pregnant woman, our efforts to guide the pregnancy to the safe delivery at term of a healthy British subject. The prevention of abortion, the foreseeing of complications in pregnancy and labour, and the devising of means of avoiding them as well as of meeting them when they arise, and then the after-care of mother and child, form together a most striking object-lesson which can be followed in all its stages in the various sections of the maternity centre. The investigation of causes of abortion or dead-birth, with a view to the prevention of their recurrence, can be demonstrated, and other cases, in which success has rewarded the measures taken and has resulted in the birth of a living child, can be shown. Any complication in labour that might have been foreseen can be pointed out as a failure in prevention. Why was it not foreseen? If foreseen, what could have been done? That our teaching in the past has been wanting in this preventive atmosphere is often illustrated in reading examination papers, or in reports from practitioners and house officers. For instance, the light way abortion is regarded, and the scanty excuses given for suggesting its induction and that of premature labour, even a little self-congratulation on having delivered a difficult case, though "the child was dead of course," all show that labour ending in a still-birth is scarcely appreciated as an obstetric failure because we have not sufficiently emphasised that the bringing of the pregnancy to the birth of a living and healthy child without danger to the mother is the only criterion of success.

We have to train the student in a late stage in his career when the wider outlook is more readily developed, and we must therefore do our best to encourage it, and agitate for our own encouragement by the examining bodies. Let the recommendations come from the midwifery teachers and be firmly pressed on the General Medical Council. Let us ask that the attendance of students shall not merely be on indoor instruction in the conduct of labour, but on antenatal and postnatal clinics, and let us ask our colleagues engaged in pædiatrics and public health work to co-operate with us in the agitation.

The question as to where obstetrics ends and pædiatrics begins need not be discussed now—it will settle itself in time with experience of working. But it is clearly our duty to encourage the study of the "well" infant and how to keep it well so long as it may be in our charge, and to stimulate our students to follow the infant through to the school clinic age.

I have only discussed general principles. Their adoption will involve variations in detail in each medical school to meet its special circumstances—the number of its students, the material available and its accessibility, and other factors. With one of my colleagues I contributed to the medical press a report of the first two years' working of the system at St. Thomas's Hospital, modelled on the recommendations of the General Medical Council, and can refer anyone who wishes for details to that paper.* Since it was written there have been considerable developments in the social and preventive work, but the difficulty throughout has been to get the student to interest himself in a side which has no examination value. We have two clinics for infants up to twelve months, and one to continue their observation to school clinic age; at present the two former are officered from the maternity department, the latter from the children's department. Even before the war the student would barely pay an occasional visit to a department for seeing "well" babies; he took little interest in "wasters" at any time, and none at all when it was but a matter of trying to prevent them becoming "wasters." The house officers, on the other hand, always became extremely interested; they recognised the value of the experience both for family practice and for future appointments as school clinic officers or other work in the public service.

If the medical schools are to meet the demand for medical practitioners for the many appointments that are likely to follow the establishment of a Ministry of Health they must be prepared to train them for the work, and I think the question as to whether pædiatrics and the study of childhood ought not to be made an examination subject is one that will have to be considered, and is one in which we ought to take an interest. The future physique of the race is largely determined during development *in utero*, during infancy and childhood, and I would urge that our teaching should be remodelled with the view that something must be done to make teachers and students devote more attention to this period of life. The necessity for some such addition to the curriculum, whether it should be for the undergraduate or postgraduate study, and how it is to be carved out of obstetrics, diseases of children, and preventive medicine, urgently calls for consideration. It would be ignominious for the medical profession were it forced on it from the outside.

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* *British Medical Journal*, 10th October 1912, p. 1006.

LIII.—REMARKS ON THE TEACHING OF GYNECOLOGY.

By VICTOR BONNEY, M.S., M.D., B.Sc., F.R.C.S., London.

I THINK that a good deal of the teaching in obstetrics and gynecology should be relegated to an earlier stage of studentship than is now the case.

For instance the anatomy of the female genitals should be taught so thoroughly in the dissection-room and anatomical theatre that there would be no need of reiteration in the obstetrical and gynecological text-books and lectures. Clinically, the diseases of the female genitals are, I should say, about ten times as common as those of the male, yet the student is exhaustively taught male anatomy, but very little female anatomy, in the dissecting-room.

Then embryology: the development and size of the fœtus: the anatomy and development of the placenta. He should know all these things before he enters on their clinical aspect.

The physiology of the female organs is not taught by physiologists. It should be; puberty, adolescence, menstruation, and the mechanism of labour are purely physiological subjects. Why should the physiological text-book spread itself over several chapters when dealing with intestinal peristalsis, and say no word on the equally important uterine peristalsis.

Again, general pathology should deal with puerperal sepsis and pregnancy toxæmia, from the general point of view, and the histologist should include the microscopical appearances of uterine tissue, tube, vagina, ovary, corpus luteum, etc., amongst the subjects which he teaches.

If these things were done, the student would have learnt a good one-third of obstetrics and gynecology before he came to the regular course on those subjects; and—and this is the most important of all—he would cease to regard them as isolated subjects, divorced from general medicine and surgery as though the diseases with which they deal were fundamentally of a different nature to the rest of disease.

LIV.—THE TEACHING OF CLINICAL GYNECOLOGY.

By N. T. BREWIS, Gynecologist, Edinburgh Royal Infirmary.

It is not necessary at this time of day to emphasise the importance of the subject to the student who is shortly to become engaged in the exercise of his profession. Women form a large proportion of the patients a medical man is called on to treat, and, to be useful in his calling, it is essential that he should be familiar with the ailments peculiar to them. He should not only be able to recognise the affections from which they suffer, but should also be able, if necessary, to give advice regarding, and to treat many of, those conditions. Every student should therefore have opportunities of becoming conversant with the various diseases of women, and should also know how to treat them. Practical knowledge of the subject must be obtained clinically at the bedside and in the operating theatre, and for its acquisition time and material are required. It may be affirmed that gynecology is the work of the specialist and not of the ordinary practitioner, and that it would be wrong to spend much of the student's time over it. While it is true that major gynecology must belong to the specialist, whose training is a post-graduate undertaking, it is only right that the student should see and have instruction in major operations, though he should have no intention of ever performing them. How much time do students give to their surgical course, and how many of them in after-life ever practise surgery? The practice of minor gynecology is quite within the province of the well-qualified practitioner.

The importance of practical gynecology entitles it to more consideration regarding the time allotted for the study of it by the student. The systematic lectures which the student receives before taking up practical work are all that can be desired. He begins his practical course with a good general knowledge of the diseases of women. The deficiency in his training is entirely in the practical part, and to remedy this shortcoming it is necessary that he should have more time at his disposal, and that the teacher should have more material at his command. At present, in the Edinburgh School, each student attends a short course of practical instruction of five weeks' duration. For a satisfactory training in practical gynecology a course of three months is needed. Abundant material for the teacher in Edinburgh could easily be obtained if the Managers of the Royal Infirmary would make Ward 34 a gynecological ward. This ward in the gynecological pavilion was built for gynecology, but has never been used for that purpose. By the acquisition of this ward the staff of teachers would be increased, and, with the additional material, the Edinburgh Gynecological School would become the strongest in the country. Edinburgh students would not require to go to other schools for their practical gynecology, and patients would no longer find it necessary to seek treatment elsewhere. In one of the present gynecological wards there is always a waiting-list of over two hundred patients.

Given sufficient time and material, all difficulties in the teaching of practical gynecology would disappear. Each teacher would arrange and systematise the instruction given according to the plan which he found best. Each student requires to be taught individually, and should have opportunities of becoming familiar with all the methods of clinical examination. He should be taught to recognise and describe the physical signs of diseased conditions and to learn the significance of symptoms. He should receive instruction in treatment, should witness operations, and perform minor ones.

The work of instruction should be divided between the gynecologist and the clinical tutor:—

1. *Instruction given by the gynecologist and the assistant gynecologist* should include instruction in physical signs of all the gynecological organs and their affections. As all the organs are concealed, it is essential for the student to cultivate specially the sense of touch; accordingly, all the methods of bimanual examination must receive special attention. Diagnosis, in many cases, cannot be made without inspection of the affected parts; therefore the student should be taught to use the vaginal speculum, the cystoscope, and the proctoscope. He should also be fully instructed in the examination of the abdomen. Before the whole class the operator should explain each step of the operation that he is performing, and, under the direction of the Chief, the student might be asked to perform some of the minor operations, should learn to handle the curette, sound, and volsella, and to pass the catheter.

2. *Instruction given by the Clinical Tutor.*—The clinical tutors, under the supervision and direction of the Chief, should perform a large and important part in the practical instruction of pupils. Their work should include tuition in the surgical anatomy of the pelvic organs, demonstrations of the naked-eye and the microscopic appearances of all the pathological specimens removed at operations, and the naked-eye, microscopic, and bacteriological characters of the various discharges. They should demonstrate the various instruments used in gynecological work, and explain their uses.

These demonstrations could be conducted in the evenings before the whole class assembled. The clinical tutors should also, along with the house surgeons, superintend and assist students in their case-taking. Case-taking forms a very necessary part of the student's training. Each student should take at least one case in a very thorough manner. He should be given a patient, and should consider her his special charge and interest until she is discharged from the hospital. Not only should tuition be directed towards a full and correct record of the case, but the significance of symptoms and of physical signs should be explained. The student should make a point of being present when his patient is operated on, and should, with the aid of the house surgeon, add to his case a description of the operation and of the structures removed. If a microscopic or bacteriological examination is made, he should incorporate a description of it in his record. The progress of the patient and her condition on leaving hospital should complete his case.

A course of training such as I have outlined should furnish the student with a good groundwork of clinical gynecology. The work which a student does, and the efficiency he acquires while taking out his course, should, if satisfactory, exempt him from having to appear for the subject at the Final Examination.

Out-Patients as Teaching Material.—The authorities should seriously consider the advisability of instituting a gynecological out-patient department in the Royal Infirmary. Such a department would not only relieve the work in the wards and prevent the long waits of patients there, but would also make a valuable addition to the teaching material. The department could be conducted by the assistant gynecologists in turn, and each day four or five students could be in attendance. This and similar work at the dispensaries would augment, in a useful manner, the teaching in the wards.

LV.—THE TEACHING OF OBSTETRICS AND GYNECOLOGY.

By JAMES HAIG FERGUSON, M.D., F.R.C.P., F.R.C.S.

I CONSIDER it is a mistake to separate the teaching of midwifery from that of gynecology. The two should be taught in a combined course under the supervision of one teacher who is qualified to teach both subjects. Apart from their intimate relationship, this saves much repetition and overlapping in dealing with the anatomical and physiological aspects common to both subjects.

I believe that the principles of midwifery can be taught in a course of fifty systematic lectures, provided that a proper system of clinical instruction is superadded. The three months' summer course formerly given by Sir Halliday Croom in Minto House was a practical demonstration that this can be successfully done by a competent teacher. It is true that one could not undertake both midwifery and gynecology in that length of time without duplicating the lectures, *i.e.* giving extra lectures on gynecology in the afternoons.

If obstetric anatomy and embryology have already been taken up in the classes of anatomy and physiology, and more faith reposed on the very adequate teaching that is given in the pathology class, a good deal that is now taught on these subjects in the midwifery class could be left out. Consequently only those matters which have a direct obstetric bearing need be considered in the systematic midwifery lectures, on the principle of "pointing a moral and adorning a tale" on the substratum of a certain amount of previously acquired knowledge. The tendency is to go into the question of anatomy and embryology in midwifery lectures as if the student had absolutely no previous acquaintance with the subjects.

It may be justly contended that every course of instruction should be complete in itself from the rudiments upwards, and I for one would strongly approve of an alternative scheme whereby a course of twenty-five or thirty lectures might be given during the summer session dealing with obstetrical and gynecological anatomy and physiology, to be followed by fifty lectures on the rest of the subject in the succeeding winter session—with, say, twenty lectures on gynecology in addition—to complete the course. Those who had attended satisfactorily the summer course might possibly be allowed to attend their cases during the autumn, which would help to save congestion later on.

The student has to be turned out as a practical man fitted to deal with the normal and abnormal obstetric cases he is likely to meet with in practice, often perforce entirely on his own responsibility. For this reason the practical and clinical teaching of midwifery is of paramount importance. I put more value on this clinical teaching and demonstration of cases in hospital than on the personal attendance on so many cases of labour. I think the number of cases attended outside could be safely diminished, but each student must have the opportunity (1) of seeing some normal cases properly managed, (2) of observing the conduct of some instrumental and complicated labours, besides (3) of following intelligently in the wards the after-care in the puerperium. All this can be secured by hospital attendance. I strongly advocate *one month* in a maternity hospital residence or hostel, in or near the hospital, and, in addition, an attendance of another month (preferably two) on the daily cliniques. During his month's residence he would be enabled to see all the night cases, and most of the complicated cases occur after the ordinary man's working hours. During the other month (or two months) he could live anywhere and come to the hospital only for the regular cliniques.

If centralisation of the outdoor midwifery work were established it would go far to meet the present difficulties of outside cases. The importance of the students being made to keep a record of the cases they attend can hardly be too strongly insisted on.

A new and enlarged maternity hospital is essential. The present hospital is not up to the standard of modern requirements, and is far from being a credit to Edinburgh.

As regards gynecological teaching, I do not agree with those who expect the general practitioner to be as proficient in gynecology as he ought to be in obstetrics. Gynecology is, after all, a specialty, and one requiring very special training. A general knowledge of the main principles is all that is required to be imparted, and a sufficient amount of clinical training to enable the student to recognise (1) normal conditions, (2) the commoner diseases, and (3) the technique of the treatment of minor maladies.

There is no doubt of the great advantage to the student of a consecutive set of lectures on gynecology—a great improvement on the one-lecture-a-week system of previous days.

The clinical teaching of gynecology is of course the great difficulty, when it has to be extended to all and sundry, owing to the necessity of strictly limited cliniques. In dispensary cliniques the patients and pupils are apt to follow an inverse ratio. So long as there are few pupils there are plenty of patients, and *vice versâ*, and much experience and tact are required on the part of the teacher to secure justice and consideration for patients and pupils alike.

The present teaching arrangements in the Royal Infirmary are a great advance on previous methods. It seems to me they meet the bare requirements of the situation. Of course every specialist tends to magnify his own department and would fain have more time assigned to his subject. Students specially interested in gynecology can always get more opportunities for instruction, and every encouragement is given to such.

I am strongly of opinion that in determining the marks at the Professional Examination the class records of the work done by the student should be taken into consideration in adjudicating the results, and this is of special importance, it seems to me, in the examination on a subject like clinical gynecology.

DISCUSSION.

Dr. Ballantyne.—I have been teaching midwifery since 1885. For twenty-six years I taught in the extramural school. During the first thirteen years I made many mistakes, the first of which was in trying to put the whole subject into my own lectures, *i.e.* in trying to act as a text-book. The second was in relegating the practical part of the teaching to the tutorial classes, a non-compulsory attendance upon which was all that was required of the students, with the result that the majority of the class were left quite untaught in the practical part of the subject. The third mistake lay in trying to imitate the attractive features in the lectures of popular teachers. To get rid of the dictational element I had my lectures printed, and found the plan worked well. I *gave* them what I used to dictate, saying, "Add to this; make a synopsis for yourself, but in the main part of the hour look at what I am doing with my hands." The second change was to make the lecture almost into a practical class, and the tutorial into a quiz class, while in the Maternity Hospital I went over the same ground clinically, and amplified what I had fallen short of in the lecture class. For some seven or eight years I conducted a class between the summer and winter sessions, which I called an "operative" class. In it I utilised as far as possible different means for teaching it practically—models of various kinds, etc.

I would join issue with Sir Halliday Croom in what he said as to there being enough cases in Edinburgh for the teaching of all the students. The facts are these: in 1916 there were 6600 births in Edinburgh; in 1917 there were 5800. In other words, there was a drop of something like 800 births in one year. Fortunately, from the teaching point of view, the number of cases dealt with in the Maternity Hospital did not fall. The explanation is that the general practitioners who would have looked after them were away and their cases were distributed, so that we in the general hospital did not feel it. 17·4 per 1000 to 14·7 per 1000 in one year is, of course, an exceptional drop. Still, we have got to arrange for as many students as we ever had, with a birth-rate which is steadily falling. We must consider, too, the death-rate of the newly born infant: can the pædiatric physicians teach about the new-born infant in the first three weeks of life? It is not being taught. Sir Halliday Croom and I have discussed this several times, and we made up our minds that three lectures would be set aside for this subject alone. This, however, has never been achieved for lack of time. The matter is urgent. Forty per 1000 living new-born infants die in the first month; 123 per 1000 die in Edinburgh in the first year. In the first week the figures are even more striking. The Edinburgh Public Health Officer states that 204 infants out of 604 die here in the first month; and of these 204, 110 are entered as having died of "immaturity." Is that a sufficient death certificate which gives no information at all beyond the fact that those children were born before time? We have the *cause* of death still to find out, and I think it is our duty as obstetricians to lay some emphasis on the subject of the new-born infant.

The Milne Murray Lodge might have succeeded had it been begun in a less ambitious way. As it was, it was a novelty, and the students did not enter it in sufficient numbers to make it self-supporting. It was impossible to carry on a hostel for fifteen or twenty students when it was only occupied for two or three months in the year. On the whole, I incline to think that it is advisable to conjoin midwifery and gynecology in our chair.

Dr. W. Fordyce.—The question seems to be: What is the best method of teaching a student to fit him for the work he will meet in his medical practice afterwards? How many lectures should there be, and how best can the clinical part be carried out? I agree on the whole with what Sir Halliday Croom said. It is necessary that anatomy and physiology be considered afresh by the student in his midwifery course; the female anatomy and the physiology of conception and pregnancy generally are not taught in a way to be of any value to the obstetrical student. The course should be divided into two parts, and in the second part the students should be divided into groups, and should come every day to the Maternity Hospital. I agree with Dr. Haultain on the importance of students actually seeing cases conducted in the Maternity Hospital. Still, I think that a great deal can be learned by merely going round the hospital ward.

As to out-door work, a man should reside for a certain time in some home in connection with a maternity hospital. And I think that that is still possible in Edinburgh. In Edinburgh there are six or eight different institutions all supplying maternity out-door work for the students, and the consequence is, that the men spread themselves over these institutions. I have pled for years with the Maternity Hospital authorities to centralise the teaching of out-door midwifery in Edinburgh—to have it taken from the dispensaries, and to have one definite system whereby a student knows that if he goes into the Maternity Hospital he will stay there for a month and will see all the work that is going on, and will in that month get out his requisite cases. If that were done, I am certain that a large proportion of the men would take advantage of the opportunity. At present, at a dispensary, a man does not get all his cases for perhaps three or four months.

By a daily visit in the latter part of their midwifery course to a hospital, where they can see the patients, the students learn a great deal. In conducting a case, for example, you can demonstrate the turning of the fœtus *in utero* almost as well as on a model in the tutorial class.

Dr. Haultain thinks three cases are enough for a man to attend. I think there ought to be more, even if they are all normal. Confidence is wanted more in midwifery than in almost any other department, and confidence can only be got by repeated attendance on cases. I think with Sir Halliday Croom that the cases should be carefully recorded, and if there were strict supervision of the student's reports, the importance of this department of his work would be impressed upon him. All that you can hope to do in gynecology is exactly what Dr. Barbour said at the conclusion of his remarks.

If we can teach a man such confidence that in making an examination he can say to the patient, "There is nothing wrong," or, "There is something that is beyond me," I think we shall have gone a very long way.

Dr. Simpson.—The mortality of infants during the first month of life is a point which must be taken up very seriously: there is a big waste of life that should not take place. Judging from the cases I have seen handled by midwives, my experience has been that they do not yet receive adequate training; and there ought to be some co-operation between the Sick Children's Hospital and the Maternity Hospital in the training of nurses as well as of students. The nurse has an enormous influence in a household, and her advice as to feeding the infant is often taken in preference to that of the young doctor attending the case.

Dr. Oliphant Nicholson.—I have always held strongly that the obstetrician should be a physician first and an obstetrician afterwards. Young infants develop all sorts of affections that the ordinary obstetric surgeon is quite willing to admit he knows very little about; the care of infants during the first month of life is really much more a medical than a surgical matter. Young infants die from improper feeding, and a midwifery nurse often takes upon herself to advise the mother what to feed the baby on. The doctor, however, is often quite willing to delegate that duty to the nurse. The young infant should not get out of the hands of the obstetrician too soon: during the first month the man who attends the confinement should be quite competent to deal with all the ordinary emergencies which occur, and to safeguard the child's life from them.

Dr. J. S. Fowler.—I have sometimes felt the care of young infants has to a certain extent been lost sight of by obstetricians. The difficulty in Edinburgh is that there is no institution suitable for dealing with these very young infants. The mother is kept at the Maternity Hospital until she is well, but she is, I think, then discharged without very much reference to the condition of the baby. It is a matter of experience that such young infants do not do well in the wards of the Sick Children's Hospital. They require quite a different kind of nursing from the older children, and a great deal more of it—almost the whole time of one woman to each infant: we really ought, also, to have wet nurses for them. They are, too, greatly exposed to infections in the Sick Children's Hospital. For the treatment of these infants we want some institutional system based on the continental plan.

Mr. Miles.—It is an open secret among those who have attended these discussions regularly that midwifery was one of the subjects to which we looked to save time. It could be got, we hoped, into something less than a whole winter term; and I am disappointed to find that the teachers of the subject demand the whole one hundred lectures course. Most of us remember the Minto House summer course, given originally by Sir Halliday Croom, which proved that midwifery could be taught for all practical purposes in a three months' course.

In various subjects it has been suggested that the course be divided into a junior and a senior course, to be taken at different times in the student's curriculum. Could that not be done in midwifery? Could we co-ordinate the professor of anatomy to give that part of his course which bears on midwifery in the fourth year instead of the first. And so with physiology.

In that way some time might be saved in the midwifery course. It would help us in framing our report if we had information on these points.

Dr. Barbour's remarks about the use of the class work as a means of minimising the importance of the Professional Examination are most valuable. The student's case records might well be used as part of the material for determining the results in the Final.

Dr. Sillar.—I have been struck with what has been said as to the amount of clinical material available. All the speakers were not at one in regard to the amount of material available, but from one of the papers I gathered that there was no deficiency. Midwifery is the only subject for which our students go away for their knowledge, and it looks to the outsider as if there was a want of co-ordination or organisation; and what I want to hear from some of the experts is as to whether the method of the Maternity Hospital management is in their opinion a good one, *i.e.* whether the system of a short tenure of office by different teachers is really one which conduces to good organisation, or whether, on the whole, it is a disadvantage.

Professor Lorrain Smith.—Dr. Tweedie in his suggested remedies says that the art of obstetrics cannot be acquired in a short period of six months of close attention to a maternity institute. The Committee would like to have a definite expression of opinion on this point from the teachers of obstetrics. I should also like to have their opinion on the question raised by Dr. Fairbairn of teaching in the maternity centres. I regret that Dr. Ballantyne did not deal definitely with this point, because a great deal of his work has lain exactly in the direction which Dr. Fairbairn sketches as the line of development we ought to adopt.

Dr. Ballantyne.—I think something ought to be allowed for the careful watching of pregnancy cases: in that way the knowledge of the student would be extended in a big department of midwifery. I have no difficulty in getting some of the students to come to the antenatal clinique although it is not compulsory, because they see how much it helps them.

Professor Lorrain Smith.—Is there no criticism of the method the students adopt of rushing away to another centre for, say, a fortnight?

Dr. Ballantyne.—That is where the whole thing is wrong. It should not be the idea of the student to see so many cases in so many weeks. The university should make him extend his knowledge of cases over a definite number of months. The practical midwifery course is and ought to be a three-months' course.

Dr. Haultain.—Dwelling in the hospital is essential for the practical knowledge of midwifery, but it must be made compulsory. The reason why a number of our students go to other places is because they can acquire that residence and get in the requisite number of cases in a certain time. By having a residency we would get our men to stay here. This residency would also attract students from other schools.

I do not agree that you can show students on a dummy how complicated cases should be treated. It gives a man confidence to see a patient with placenta prævia being treated. From that point of view it is important that the men should *see* all the complications. We are a great centre here for complex cases, and in his compulsory month of residence the student would see and study complications that he would otherwise never have an opportunity of observing.

We have not nearly enough out-door cases to give the students twelve cases each, for we have also a large number of nurses to teach. The Maternity Hospital is the centre for that teaching, and every case that a nurse attends with a student does not count for the nurse. A few cases on his own is quite enough for each student after having conducted his cases in the hospital under direct supervision.

I cannot see how you can give a course in midwifery and gynecology in fifty lectures. Midwifery has this difference from the other subjects, that it must be known from top to bottom because the practitioner has to be thoroughly versed in all the complications. A preliminary course of twenty-five lectures might be arranged in order to allow the student to come when he wishes to the Maternity Hospital, and a subsequent course of fifty lectures.

Dr. Barbour said in reply.—With regard to the question of residence in the Maternity Hospital, stress was laid upon the word "compulsory." You may bring a horse to the water, but it is another thing to make him drink. The student might live in the hospital in the winter months, but does that necessarily mean that he would do the work any more conscientiously than if he were not resident there? A residence in the vacation is of course *very* desirable, and would be made full use of. But during term time the student residing in the Maternity Hospital must attend his lectures during the day, *i.e.* his work occupies him from 9 A.M. to 6 P.M., so that the only time he can attend the Maternity Hospital and see the cases is during the night. Someone suggested that a sort of middle course of having the students staying near the Maternity Hospital would do a great deal for them; and I think it would, in that the student would be at night near the hospital and could be sent for. But I think it is quite a mistake to go away with the idea that you can *compel* a man to have the benefit of residency in the Maternity Hospital during the winter session. I should like to know to what extent the residency in Dublin is made use of. I believe that during the winter session the students do not make use of it, although it is just at their door, owing to the difficulty of combining with it their other medical work.

A very important point was raised by Dr. Haultain as to whether you will get a man to come to Edinburgh to take up midwifery and gynecology. He is quite right that the attractive part of the work is the gynecological part. The great difficulty that I see in returning to the former state of affairs is, that the clinical work in the hospital under the new conditions has increased so much that I cannot see where the necessary time is to come from: If the professor had to teach both gynecology and midwifery, it would be impossible for him to teach the elements of gynecology to the students as it is being taught to-day. He would have to hand it over to the assistant gynecologist or to the tutor.

It is a fact that the interest the students take in their gynecological work has increased very much since the clinical examination was introduced. During recent years one notices a distinct improvement in the knowledge of the graduates in clinical gynecology. As compared with those of twenty years ago, the strides they have made are enormous.

LVI.—FORENSIC MEDICINE AND THE CURRICULUM.

By Professor HARVEY LITTLEJOHN.

I DO not propose to detain you very long to-night, because, while I am second to none in regarding forensic medicine as a valuable and necessary part of the curriculum, I quite recognise that it has not the same importance as many of the other systematic subjects and that it is more capable of being easily adapted to a new curriculum scheme, subject to certain conditions which I shall mention later.

Forensic medicine may be described as the subject which enables medical men to discharge their duty to the State in relation to the law of the land. It brings before the medical student the relationship between the law and the subjects which he has already studied—medicine, surgery, midwifery, etc.—and shows him their application to the administration of justice. It may also very properly include instruction upon the relationship which should exist between a medical man and his colleagues on the one hand, and medical men and their patients on the other—so-called medical ethics, or that knowledge which enables the medical man to formulate his life and conduct, both in a professional and public respect, according to the rules which ought to guide us as members of a liberal profession.

I will only refer very briefly to three questions in connection with the subject of to-night's discussion, viz.: First. When ought forensic medicine to be taught? Second. What ought to be taught? and Third. How ought it to be taught?

In regard to the first proposition—When ought forensic medicine to take its place in the curriculum?—I have no hesitation in advising that it should come not earlier than the end of the fourth year of study; that is, after the student has attended qualifying courses in surgery, medicine, and midwifery, and also in mental diseases. I think it is practically useless to attempt to give a course in forensic medicine unless a student has a knowledge of these subjects. It must be apparent to all that it is only a waste of time to discuss, for example, criminal abortion with undergraduates who have no knowledge of pregnancy, delivery, or the ordinary causes of abortion; or to talk to them of wounds in their medico-legal aspects when they have had no surgical instruction; or again, to deal with the symptoms of opium poisoning when they have not had a course in medicine and are unable to appreciate points in the differential diagnosis from other causes of coma.

After twenty-eight years' experience in teaching I am convinced that it is not possible to deal satisfactorily with the subject in a course of less than fifty meetings, notwithstanding the fact that I only attempt to give an elementary course.

When we come to the question of what ought to be taught, I hold that, so far as the undergraduate is concerned, the object of the teacher ought to be to give such instruction as will enable a medical man to deal with the medico-legal cases which he will meet with in the general practice of his profession. The great majority, we must remember, of those who enter the profession will take up general practice, and in my opinion the aim ought to be to enable them to acquit themselves in the witness-box or elsewhere when acting in a public capacity without discredit either to themselves or the university and profession to which they belong. That, one may say, is a low educational standard, but it is a practical and very important standard to maintain, and seems to me much better than attempting to impart knowledge which has no direct relation to their future work. We must aim at sending out men qualified to deal with the ordinary medico-legal problems which are of frequent occurrence in general practice; for example, in the case of a newly born child which has been found dead, the doctor, by post-mortem examination, should be able at once to determine whether it has lived or not, and whether therefore it is a case demanding police investigation, or, on the other hand, that judicial proceedings are unnecessary. Again, in connection with charges of criminal assault upon women and children, which are so very common all over the country and which entail a heavy responsibility upon a doctor, since it is usually upon the medical evidence that cases proceed to trial, he should be thoroughly acquainted with the methods of examination and the proofs upon which guilt or innocence depend.

In many schools, though more so in the past than at the present time, I venture to think that a great deal too much stress is laid upon toxicology; indeed in some schools one half or more of the time devoted to forensic medicine used to be spent on toxicology. This appears to me to be absolutely useless. The medical practitioner ought to know the symptoms of poisoning, the characteristic post-mortem appearances, and he should have a knowledge of the treatment of cases of poisoning, but the question of the chemical recognition of poisons is not a matter for the general practitioner. He is not competent to deal with this aspect of toxicology from any teaching that could be given to him in an elementary course, nor ought he ever to be called upon to do an analysis in connection with a criminal charge, since this is essentially a matter for the trained and expert chemist. A medical practitioner must, however, be able to perform the post-mortem examination in a case of suspected poisoning in such a way that it will afford the expert chemist all that he requires for a satisfactory analysis.

Thirdly. How ought forensic medicine to be taught? The instruction, as I have indicated, should be elementary and in the form of lectures, illustrated by specimens, lantern slides, and photographs, but, above all, it should be made, as far as possible, practical by demonstrations on the living and the dead. I do not think that the systematic lecture can be altogether discarded, and especially when given by a teacher who has a practical knowledge of the subject. Such lectures are useful in indicating to the student what parts of the many good text-books at his disposal will repay careful study, while he can, from his own experience, illustrate in a striking and practical manner many of the difficulties which frequently occur.

While demonstrations on the living, as for example of wounds and other forms of violence as well as cases of mental unsoundness, should be given, yet it is with the dead that forensic medicine is chiefly concerned. The dead body is to the medical jurist what clinical material is to the physician and surgeon, and what the post-mortem room is to the pathologist. A student must be made to see and do things for himself, and such practical training is no less important and valuable in forensic medicine than in other branches of the curriculum. To demonstrate to a class a case of hanging, drowning, overlaying, etc. is worth hours of lecturing, and leaves a mental impression which is never effaced and proves of inestimable value to the student in his future career. What comparison can there be between lectures on infanticide and a single practical demonstration on a newly born infant of how to determine the questions of maturity, respiration, live birth, and the cause of death? in fact the whole of the problems involved in a charge of this nature may be dealt with in a single demonstration and in a manner impossible in the lecture-room.

In addition to the opportunities afforded for practical study in the mortuary, the teacher of forensic medicine must have a laboratory in which students can make themselves familiar with the methods of examining blood-stains under various conditions and in such a manner as to afford evidence satisfactory for a Court of justice. They should be able to apply the tests in suspected carbon monoxide poisoning and must have practice in the recognition of seminal stains as well as proficiency in the use of the microscope for medico-legal purposes.

It may be argued that the opportunities for practical instruction such as I have outlined are impossible to provide. This, no doubt, is true to some extent, but the difficulties in the way are not insuperable. Much may be effected by means of an understanding with the pathologist of the hospital, but it is equally essential that the teacher should be in close association with the police, holding the office of police surgeon if possible, so that he will have at his disposal, for instructional purposes, cases of assault, mental derangement, etc., and also bodies which are removed to the police mortuary. This association of police work with the professorship of forensic medicine has fortunately been secured in Edinburgh, and the arrangement was largely due to our late principal, Sir William Turner, who saw the importance of our students getting as much practical instruction as possible. A similar arrangement should not be difficult in other medical centres; and even in England, where the criminal procedure is somewhat different, an understanding with coroners might be made which would permit of students having similar opportunities to those enjoyed here.

A difficulty which exists in connection with all practical teaching is caused by large classes. While it is possibly a stimulus to lecture to a large number, efficient practical teaching is out of the question unless the numbers are limited. How this problem is to be solved I do not know, since at present, although I subdivide my students into sections so far as possible, the numbers are still too large to secure satisfactory practical teaching.

DISCUSSION.

Dr. Dickson said that his most vivid recollection of his course in forensic medicine was that of Professor Sir Henry Littlejohn taking his class to the Court of Justiciary, where they saw a criminal trial and learned the first principles of the laws of evidence in medico-legal cases.

Dr. Matheson Cullen.—I have an opportunity, to some extent unique perhaps in Scotland, of meeting men all over the country. One thing that has struck me particularly is the enormous amount of rivalry between doctors; many of the differences between doctors arise from the fact that they do not freely and frankly talk things over together, and do not understand the proper relationship which should exist between them. The reason very largely is that medical ethics do not form part of the curriculum. Three lectures in this subject are quite insufficient; it should form a very important part of the discussion on forensic medicine.

Dr. J. V. Paterson, referring to the question of medical witnesses, said that there should be absolute neutrality in the witness-box. Men should not go into the witness-box primed by lawyers to give evidence in favour of this man or that. In cases involving questions of ophthalmology, for instance, men go into the witness-box and give very vague and misleading evidence. This has, however, been improved by the appointment of medical assessors. This neutral point of view could be inculcated in the students' minds by no one better than by the professor of forensic medicine.

LVII.—THE TRAINING OF MEDICAL STUDENTS FOR GENERAL PRACTICE.

By J. W. CRERAR, M.B., F.R.C.S., Maryport.

WHILE fully sensible of the honour done me by the Committee of the Pathological Club, I feel a natural diffidence in offering any opinions on medical education to a body of men whose time and efforts are chiefly devoted to its exposition. With the knowledge, however, that Sir James Mackenzie, who delivered the opening address of your course, was once a general practitioner (and may I suggest that his achievements and authority have given a new dignity and importance to the calling of the general practitioner), and with the recollection that the bulk of the students who pass through your hands are destined to become general practitioners like myself, I was emboldened to essay a contribution towards the problem you are engaged in considering.

It seemed to me that I could most usefully occupy your attention by endeavouring to place before you some aspects of the general practitioner's daily work. You can hardly have that intimate knowledge of such work and its conditions which a man who has spent a quarter of a century in general practice should have gained. The preponderating majority of the students who fill your classes, for whose education you are responsible, and who, throughout their lives, will bear the impress of your teaching, are men and women who go out into the world as general practitioners. It is unnecessary to speak of the importance of their duties. It is enough to say that the medical tendance of the nation is largely in their hands. I am encouraged to hope that I shall not be wasting your time if I venture to suggest some considerations arising out of general practice which appear to me to have a direct bearing on the character of the training given in our medical schools.

I shall deal first with the question of *Industrial Accidents*. During the past three years I have had a special opportunity of observing the character of the accidents which occur in industrial life. In March 1915 Dr. Harper, who is the medical officer to the Cumberland Coal and Iron Ore Mine Owners' Indemnity Company, obtained a commission in the R. A. M. C. His duties mainly consist in examining and reporting on the workpeople injured in the coal mines, the iron ore mines, the steel and iron works of Cumberland. In order to "carry on" for him, Dr. Fletcher of Workington, Dr. Pratt of Whitehaven, and I distributed his work amongst us. I have therefore been responsible for examining and reporting on about one-third of the workpeople involved.

For the purpose of this analysis two full years have been taken—1915-16 and 1916-17. I had to decide the category into which a given case had to be placed, and have taken as my definition of a "serious accident" an accident (apart from those fatal immediately or in a few hours) which threatened life, or led to a definite and permanent loss of earning capacity. The figures for the "serious cases" do not include those fatal immediately or in a few hours. This diminution is probably offset by the fact that certain serious cases which came under my observation incurred the accident before March 1915. On the other hand the figures for the "minor cases" do not include those so slight that work was resumed in a few days. All the cases enumerated were therefore in receipt of weekly compensation payment.

The criterion I have chosen is therefore one of *results*, and is reliable only in so far as my judgment is correct in the assignment of the cases.

For the purpose of more ready illustration the figures are presented in the form of graphs.*

It will be observed that the "minor injuries" exhibit an immense preponderance over the serious cases. Of 806 cases 92·6 per cent. fall into the category of "minor" accidents, and 7·3 per cent. into that of "major."

It may be of some interest to you, although not necessarily relevant to the inquiry, to note the distribution of injuries throughout the body. In the upper extremity, the site of 46·9 per cent. of the whole of the injuries reported on, the majority (83·8 per cent.) were those of the fingers, thumb, hand, and wrist—the most actively engaged of the component parts of the upper limb. In the case of the lower extremity, where injuries were 32·3 per cent. of the whole, the distribution, as one would expect, is more equal throughout the limb; the toes, foot, and ankle being responsible for 49·7 per cent.

Direct injuries to the skull and spine were nearly all serious, as was the case also with burns in coal pits.

I venture to suggest that these figures bear out the contention that minor injuries constitute the preponderating majority of all industrial accidents, and when it is realised that linseed poultices are still employed in the treatment of septic wounds, and carron oil in the treatment of burns, it is not too much to hope for that treatment directed towards the adequate primary disinfection of wounds, rendered, as is perfectly feasible, by foremen in pits or works immediately after the receipt of the injury, with satisfactory subsequent care, would so diminish sepsis as to expedite recovery and largely prevent disabling sequelæ.

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* Owing to the exigencies of the war it is not possible to publish the graphs.

I am convinced that the experience of insurance societies and indemnity companies dealing with payments under the Workmen's Compensation Act would demonstrate that the bulk of their expenditure is in relation to injuries which would be classed as minor, and as these payments are based on average weekly earnings they are a direct index of the working time lost to the nation. In the case of a people so largely devoted to industrial pursuits as our own it is clear that the expediting of recovery (apart altogether from prevention) of minor injuries would lead to a great increase of industrial efficiency.

It is of the utmost importance, from this standpoint alone, that students should be thoroughly trained in the treatment of minor injuries. Regular and prolonged attendance at the surgical out-patient department should be required. It is not sufficient that such attendance should be restricted to a definite period of three or six months. It should form a part of the practical training given throughout the whole of that period of the student's career which is devoted to the clinical study of his profession.

With such preliminary training the general practitioner will become, what he ought to be, the specialist in minor injuries.

I shall now attempt to give you as clear and complete a picture as I can of the actual daily work of a *general practitioner*. To this end I have made an analysis of my own practice for certain months, and I depend largely on graphs for its illustration. The first graph is not of much importance. It indicates the average monthly proportion of visits at patients' homes and consultations in my own house.

To indicate the *ages* at which patients consult their doctor, graphs have been made for the months of June and August 1917 and of March 1918. Doubtless the war has had some modifying effects on the figures for early adult life—so many young men having joined the Army, and so many girls and young women having entered munition factories. The most uniform feature is the large number of cases attended during the first ten years of life, indicating the necessity of adequate training in *children's diseases.*

An analysis of *sexes* between the ages of twenty and ninety years for June 1917 and March 1918 shows that more women than men came under treatment, but possibly this may not be the usual proportion, as, not being on the panel, my practice may be affected by the fact that it is almost entirely private. I make no claim, therefore, for any of these data except that they represent actual personal experience in general practice in an industrial area, and personal experience is the only justification for my addressing you to-night.

As in the case of industrial accidents, an attempt has been made to differentiate between minor and serious cases. A different standard has been employed. In the case of accidents the distribution was determined by *results.* In this analysis the criterion is one of *probabilities* and *possibilities.* A case is adjudged to be "serious" when there is the probability or possibility of the occurrence of death, of grave illness, of serious interference with the general health or with the full capacity of any organ.

Somewhat arbitrarily a distinction has been drawn between children's illnesses and those of adults, the age of fifteen years having been taken as the dividing line. It will be observed, contrary entirely to my expectation when the analysis was begun, that the proportion of "serious" cases is high—13 out of 87 in children under 15 years and 97 out of 229 cases above that age. It seems desirable therefore to consider in more detail the character of the diseases. At the risk of boring you, I ask your attention to the classification of the actual cases entering into the analysis exhibited by the diagram. It is not to be understood that these are all fresh cases seen during the month of June 1917, but every case enumerated was actually attended or under actual supervision in that time. Some, as will be evident, are chronic cases. In a few the diagnosis of the definite morbid condition present was arrived at subsequently. For the basis of the classification I have followed that employed by Sir William Osler in his text-book, modifying it to allow of the inclusion of surgical conditions and affections of the special senses, etc. In certain instances cases are counted more than once in accordance with the involvement of more than one organic system.

Cases under Treatment or Supervision, June 1917.

Specific Infectious Diseases—			
German measles			4
Whooping-cough			7
Pneumonia (lobar)			1
Septicæmia			1
Syphilis	acquired, general	1	3
	acquired, cerebral	1	
	congenital	1	
Tuberculosis	lymphatic glands	4	8
	lungs (phthisis)	3	
	hip	1	
Intoxications and Sunstroke—			
Sunstroke			1
Constitutional Diseases—			
Arthritis deformans			4
Chronic rheumatism			1
Diabetes mellitus			1
Rickets			5
Infantile	malnutrition	1	3
	dentition	2	
Diseases of the Blood and Ductless Glands—			
Blood—			
Anæmia (chlorosis and secondary)			17
Anæmia (progressive pernicious) 1 & (?)1			2
Thyroid—			
Exophthalmic goitre			1
Hyperthyroidism			3

Diseases of the Digestive System—			
Mouth—			
Acute catarrhal stomatitis			1
Leucoplakia buccalis			1
Pharynx—			
Subacute pharyngitis			2
Tonsils—			
Acute follicular tonsillitis			1
Acute suppurative tonsillitis (quinsy)			1
Œsophagus—			
Carcinoma	opposite cricoid	1	2
	gastric junction	1	
Stomach—			
Gastric dyspepsia			16
Chronic gastric dyspepsia			5
Gastric hæmorrhage			1
Carcinoma of stomach			1
Duodenal dyspepsia			2
Duodenal ulcer			3
Intestines—			
Catarrhal enteritis (diarrhœa)			3
Diarrhœal diseases in children			3
Appendicitis	catarrhal	1	2
	suppurative	1	
Constipation			5
Colitis	simple	1	3
	muco-membranous	2	
Hæmorrhoids			1
Perineal fistula			1
Hernia (inguinal)			1
Peritoneum—			
Suppurative peritonitis (appendicitis)			1

Diseases of the Respiratory System—

Nose—

Epistaxis	1
Fœtid atrophic rhinitis	1
Sinusitis (catarrhal—frontal)	1

Larynx—

Acute catarrhal laryngitis	1

Bronchi—

Acute bronchitis	5
Chronic bronchitis	1
Bronchial catarrh	11
Bronchial asthma	7
Bronchiectasis	1

Lungs—

Broncho-pneumonia	2

Pleura—

Acute pleurisy (plastic)	2
Empyema	1

Diseases of the Kidneys and Genito-Urinary Organs—

Acute nephritis (trench)	1
Chronic nephritis	1
Renal calculus	1
Hæmaturia	1
Retention—enlarged prostate	1
Stricture of urethra	1
Phimosis	1

Diseases of the Circulatory System—

Heart—

Chronic valvular disease (including senile heart disease)	15
Angina pectoris	1

Arteries—

Arteriosclerosis	9

Diseases of the Nervous System—

Afferent System—

Locomotor ataxia	1

Diffuse and Focal of Spinal Cord—

Syringomyelia	1

Diffuse and Focal of Brain—

Cerebral hæmorrhage	4
Cerebral embolism	1

Peripheral Nerves—

Neuritis	1
Sciatica (a missed case—rectal carcinoma)	1

General and Functional—

Paralysis agitans	1
Acute chorea	1
Epilepsy	5
Neurasthenia	4
Senile dementia	1
Hysterical contracture	1
Old age	4

Obstetric and Gynecological Cases—

Confinements	5
Hyperemesis gravidarum	1
Abortion	1
Ovaritis	1
Endometritis	2
Prolapsus uteri	2
Ovarian cyst	1
Vaginitis	1
Pelvic cellulitis	2
Menopause	2

Diseases of the Mamma—

Carcinoma (scirrhus)	2

Diseases of the Eyes—

Conjunctivitis	1
Dendritic keratitis	1
Traumatic ulcer of cornea	1
Cataract	1
Glaucoma (simplex)	1
Superficial injury to cornea	1
Refractive errors	2

Diseases of the Ears—

Cerumen	3
Otitis media (chronic)	3

Diseases, etc., of the Skin and Subcutaneous Tissues—

Impetigo	5
Seborrhœa	2
Ringworm	2
Scabies	3
Lupus { vulgaris 3 erythematosus 1 }	4
Acne rosacea	1
Superficial nævus	1
Eczema	1
Prurigo (?)	1
Pruritus ani	1
Boils	3
Venereal warts	1
Varicose ulcer	3
Subcutaneous abscesses, including whitlows, etc.	9
Burns (superficial)	1

Accidents to Bones and Joints—

Colles' fracture	1
Sprain of elbow	1
Fracture of humerus at elbow	1
Dislocation of shoulder	1
Fracture of tibia (simple)	1
Compound fracture of tibia and fibula	1
Fracture of shaft of femur	1
Fracture of neck of femur	2

Crushes, Bruises, Wounds, etc.	19

I apologise for inflicting such an arid catalogue upon you, but it serves the purpose of demonstrating that the proportion of serious to minor cases has not been reckoned too highly. It also demonstrates the importance and variety of cases which come before the general practitioner.

Before attempting to draw any deductions from these analyses, I append a table indicating certain systems involved at the ages of 20 to 90 years for the months of June 1917 and March 1918 :—

	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	80 to 90	Total
June 1917.								
Circulatory system (Cardio-vascular)	1	1*	0	8*	11*	7*	2	30
Respiratory system	3	5	1	6	4	3	0	22
Digestive system .	5	8	5	6	3	3	0	30
Blood . . .	5	6	0	1P	1P (?)	0	0	13
	14	20	6	21	19	13	2	95
		* Specific Hemiplegia.		* Two Hemiplegia.	* Two Hemiplegia.	* One Hemiplegia.		
March 1918.								
Circulatory system (Cardio-vascular)	0	1*	1	2	12*	5*	2	23
Respiratory system	4	4	5	2	5	8	0	28
Digestive system .	3	4	5	4	2	2	0	20
Blood . . .	9	2	5	0	0	0	0	16
	16	11	16	8	19	15	2	87
		* Specific Hemiplegia.			* Four Hemiplegia.	* Three Hemiplegia.		

The outstanding features of these tables, even if the diminishing number of people living with the advancing years be not taken into account, are the increasing number of patients suffering from disorders of the circulatory system when over 50 years of age, and the fact that anæmia (chiefly chlorosis and secondary anæmias) occurs in the early decades of adult life. In all probability, although the data are necessarily scanty, these tables correspond with the average age-incidence of the diseases of the various systems named. One can readily understand the increasing incidence of cardio-vascular troubles with advancing years, but why should blood disorders (as a rule not threatening life immediately or remotely) be so prevalent before the fortieth year?

In venturing to found any opinions on the analyses presented to you (and this applies both to the analysis of industrial accidents and to that of the character of the cases occurring in general practice), in view of the relatively small numbers considered, I am fully aware that any deductions can only be tentative and suggestive. But, at the least, the analyses corroborate the opinion of Sir James Mackenzie, enunciated in his opening address, that it is the general practitioner who "sees the conditions which predispose to disease; he sees its inception and the course it pursues, passing from the signs for medical treatment to the time when it calls for surgical interference. He sees the after-effects of operations . . . . If he be stimulated to inquire into the symptoms of disease, he is brought into contact with every special department, and has the opportunity for estimating them at their true value."

Obviously the conditions which approximate to those under which the general practitioner works (I am referring especially to "office" or "surgery" attendance) are not to be found in the wards of our large infirmaries but in the out-patient departments and the dispensaries. The patient presents himself at the dispensary or to a general practitioner when, in Sir James Mackenzie's words, he has "become conscious that all is not well with him," and he may complain of little more than "disagreeable sensations." It has to be decided if there be some unimportant and temporary derangement of function or whether some graver condition exists. Diagnosis is the all-important first step, and in spite of "the most careful examination no evident sign of disease may be perceived." But is sufficient attention given to that stage of disease "most difficult to diagnose and the most hopeful for treatment" in the out-patient departments and in the dispensaries? Are they equipped with all the necessary aids to the most careful examination? It is true that the experienced physician or surgeon may shrewdly guess by instinct, or rather as the result of conscious and unconscious observation, that the actual condition present may be more serious than the patient's complaints might suggest, and is impelled to investigate thoroughly where the inexperienced, or careless, or overworked doctor might be content with a lightning diagnosis and a haphazard shot at treatment. Experience can only come with opportunity and the lapse of time, but careful examination is within the compass of the youngest. How is he to differentiate the serious from the minor case without it? Surely he should receive part of his training in surroundings where the serious and the minor cases come at random. Is it not worth consideration whether all the applicants for hospital treatment (with the exception of those dangerously ill) should not enter the wards by way of the out-patient departments? Should these departments, both medical and surgical, and the dispensaries not occupy a more important place in the training of the student? If so, "side-room work" must be considered as essential to the out-patient departments and the dispensaries as it is in the wards. And if the student is to carry out this side-room work in his daily practice as a general practitioner, it will be found that those methods will be most valuable to him which are the most simple and speedy, so long as they be reliable. In this respect the qualitative tests are more useful than the quantitative. It is idle to expect that all these minor investigations can be relegated to some central pathological laboratory. The bulk of general practitioners work in the country or in small towns. Unless the practitioner conduct them himself many of his patients must go without their assistance. A blood-serum tube, a thermos flask as an incubator, and Neisser's stain will allow of confirmation of a diagnosis of diphtheria in a few hours. In a suspected case of ringworm a few hairs may be put into benzol and in a short time be mounted direct into balsam (with which the benzol is miscible) and a beautiful specimen of the mycelium may be secured. And so on.

Sir James Mackenzie laid much stress on the study of *subjective sensations* and thinks that as bacterial invasion "gives rise to sensations, it is likely that each organism gives rise to peculiar sensations," and that as "most of the symptoms, on the entrance of microbes into the body, will be subjective, by the careful correlation of these subjective sensations with particular microbes, in course of time the object (of diagnosis) will be achieved," without recourse to laboratory methods. This may be perfectly true: but as Sir James says, "before we are capable of appreciating the patient's sensations, it is necessary for us to have experience of large numbers of individuals who have suffered, and to have made a careful correlation of their sensations with the morbid condition which may be present . . . but it is absolutely necessary that the investigator shall have a long and careful training if he is to be capable of eliciting and understanding the facts" (*Principles of Diagnosis and Treatment of Heart Affections*, chap. i.).

I will add that a considerable insight into human character is also required.

This raises the eternal difficulty, *si jeunesse savait, si veillesse pouvait.*

Is it not equally probable that, with any disturbance of function, especially if it be dependent on bacterial invasion, changes in the metabolic processes of the body occur, and that a more intensive study of the excreta (especially the urinary) will reveal evidence of disease, and of the particular disease, before the appearance of physical signs? The information derived during recent years from the study of acetone and its congeners in the urine is an illustration of the illumination to be gained from this source, and is also an admirable illustration of the direct bearing such simple research has on treatment.

It is not easy for the busy practitioner, working most frequently single-handed, to work out these methods for himself, but if the out-patient departments and the dispensaries become centres of research in this direction, the student will have been trained to go out into general practice with the instinct of research ingrained in him, and his powers of diagnosis, prognosis, and treatment will be profoundly and beneficially affected. There need be no fear that such a man, even in the stress of professional work, will readily lose the inspiration of his training, nor will he be content to pass blindly by the opportunities daily presenting themselves to him.

Unless the out-patient departments and dispensaries have wholly changed their character since my student and young graduate days, I recognise that the considerations I have advanced imply a somewhat revolutionary conception of the place they should occupy in the training of medical students. Students, teachers, and examiners are all affected. (i.) Much heavier demands on the time of the teacher would be made and probably many more teachers would be required. (ii.) Heavy expense in connection with the equipment of the out-patient departments and the dispensaries would be called for. (iii.) The dispensaries would needs be directly linked up with the departments devoted to practical clinical work. (iv.) The work done in these quondam accessory or auxiliary side-shows would require to be taken into account in examining a student for his degree. But only by some such reorganisation can the earlier stages of disease be studied under circumstances favourable alike to patient, student, and teacher.

I have no doubt, from what I have seen in general practice, that Dr. John Robertson was perfectly correct in his contention that much could be done in preventive medicine were the conditions which lead to duodenal ulcer, gastric ulcer, hyperemesis gravidarum, and many other diseases sufficiently studied, and that "they could be tackled with advantage." This is another field of work which would naturally fall to be cultivated in the out-patient departments and the dispensaries.

The classified list of conditions dealt with in the June (1917) table indicates the range over which the activities of the general practitioner are spread: it suggests the necessity of sufficient training in the various special subjects, and at the same time it exhibits one of the difficulties which face him in conducting systematic research from the paucity of similar cases in a given time, *e.g.* he may see a case of pernicious anæmia not once in a year.

Some recent developments, which were in operation before the war, have emphasised the need for students receiving as much practical training as is possible during their university career. The tradition for a young graduate of spending two or three years as assistant to a general practitioner has largely passed away. The National Health Insurance Act is not without responsibility for this result, whether that result be considered satisfactory or otherwise. In midwifery also the extending, and I consider entirely beneficial, employment of trained midwives limits the opportunity of experience in this direction, emphasising again the need for as much practical training as possible. On the other hand, the increase in numbers of well-equipped cottage hospitals makes it possible for a higher standard of surgery and clinical medicine to be looked for and attained.

The importance of prolonged and applied study of anatomy and pathology cannot be overestimated. I speak as a country doctor and I do not grudge one hour of the time I spent in studying anatomy, whether as a student or as a demonstrator in the university and the New School dissecting rooms. If I may venture on a criticism on the way clinical medicine and surgery were taught in my student days—a method which may, for all I know, have completely changed since then—I would say that the greatest defect was the lack of co-ordination in the teaching of medicine and surgery, and the immediate ancillary—or should I say basal?—so-called theoretical subjects. Everything was in a water-tight compartment. When a student was studying practical surgery he saw little, if anything, of medicine, and when, in his final sessions, he was studying clinical medicine he hardly set foot in the surgical wards or the surgical out-patient departments. Is there insuperable objection or difficulty in the way of clinical medicine and clinical surgery being taught concurrently? Is it essential that when studying practical surgery the student shall spend all his infirmary time for six days a week in the surgical wards, to the complete exclusion of work in the medical wards, and *vice versâ* as regards medicine?

But the question arises here, What is the general practitioner of the future to be?

Is it quite certain that the health of the nation is to be more carefully tended when zymotic diseases, tuberculosis, syphilis, maternity and child-welfare work, *i.e.* mothers and infants, school clinics (Why not also diseases of the eyes, ears, throat, skin, etc.?) have all passed into the hands of State officials, at least so far as treatment is concerned?

I presume that general practitioners of some sort must exist, even in a State medical service. If so, patients must, in the first instance, consult such a general practitioner who, *ex hypothesi* being incompetent to carry out treatment (a long step towards making him so *de facto*), is to be responsible for the relatively simple and unimportant matter of diagnosis! I admit that the young State (or county) medical official is apparently the most efficient investigator of the origins of disease if one can judge by his ready, and, I suppose, reliable diagnosis of pre-tubercular conditions. To diagnose disease in its earliest stages is an ideal to strive after. The ability to foretell its incidence stirs my admiration, but I am left despairing, and perhaps unenvious, of emulation.

If the general practitioner is to be a diagnostician only and the tender of minor ailments and injuries, he will soon cease to be a diagnostician, and his other duties, without grave loss, may be handed over to the nurses attached to the State service. That the true aim of the medical profession is the prevention of disease no one will deny. That the direct assistance of the State is required for the prevention and control of disease every one is agreed. But analogies drawn from the Army are not directly applicable to civil life. A bureaucratic medical State service implies a drilled and subservient people. The National Health Insurance Act points a path towards that consummation. But, unless the British genius, combined of tradition, independence, and individual initiative, be wholly wrong, and the Prussian conception of State domination be wholly right, I cannot believe that the conversion of the medical profession, as we have known it, into an establishment of State medical officials, whose necessary preoccupation is to consult the fads and prejudices of their immediate official superiors, will tend to the humane development of the human healer, to the progress of medicine, or to the conquest of disease.

Sir James Mackenzie, who seems to consider that the general practitioner is still a useful member of the community, is surely right when he contends that the man who has the opportunity of seeing disease in its early and later stages should be an investigator, a researcher. I have touched on some of the difficulties which confront him. Usually he works single-handed; not infrequently he is overworked; his activities are diffused over a wide range of interests; he is constantly interrupted; and he is hampered by the paucity of similar cases. As a rule he is not trained to be an investigator. He is not expected to be an investigator. He is not encouraged to be an investigator. Is any kind of incentive held out to him by this or any medical school to prosecute research? As Sir James Mackenzie says, "We see money poured out for the advance of medical research, but whoever thinks of utilising the opportunities of the general practitioner" (*Principles of Heart Affections*). And yet those opportunities are boundless. Doubtless it is the fault of the general practitioner that so many of those opportunities are neglected, but has the school that trained him no responsibility? He suffers from the common disadvantage of being human and requires the same spurs and inducements as are effective in other branches of human activity. Is his Alma Mater so bankrupt in invention that she cannot devise some means of keeping him "screwed up to concert pitch"? *

I have endeavoured to give you, as faithfully as I can, a picture of the daily work and problems of the general practitioner. His training is in your hands. No one can overrate the difficulties of your task. The position and authority of the medical profession do not depend alone on the immense importance of its duties to the commonwealth, but upon the intellectual and moral capacity of the individual practitioner to discharge them. I shall conclude with the words attributed to the greatest general practitioner of all time:—"Medicine is of all arts the most noble . . . whoever is to acquire a competent knowledge of medicine ought to be possessed of the following advantages: a natural disposition: instruction: a favourable position for the study: early tuition: love of labour: leisure" (Hippocrates—νομος).

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* The institution of post-graduate classes is undoubtedly a step in the right direction.

LVIII.—THE TRAINING OF MEDICAL STUDENTS FOR GENERAL PRACTICE: RECOLLECTIONS AND REFLECTIONS.

By D. ELLIOT DICKSON, M.D., F.R.C.S.(Edin.).

I HAVE been asked to speak of four things: (1) The general practitioner—how far has he found himself wanting in the knowledge of certain aspects of his subject, especially in his earlier days in practice? (2) What views he may hold regarding a better provision against such defects in future generations of practitioners. (3) What is defective in the undergraduate's training which might be removed by some change in the methods of tuition. (4) Any suggestions.

One and three may be taken together, and two and four. I probably have nothing new to offer on any of these heads, but I felt that the reiteration of the same story from different sources might be valuable. One hopes, in fact, that the repetition may not be vain, and that we may be heard for our much speaking.

First, let me say that I am strongly of opinion that there is nothing radically wrong with the teaching of the Edinburgh School of Medicine. When one sees the average type of graduate turned out from Edinburgh and recognises the immense amount of sound knowledge which he possesses, one feels chary about altering seriously a curriculum which has produced such a result. During twelve months in a General Hospital in France, where I happened to be in charge of the Medical Division, we had many discussions on Edinburgh *versus* Glasgow, both of which were represented, although the majority of our mess were London graduates. It was invariably held, I think, that Edinburgh had been (at least) the better school, and had reached its zenith in the year in which each one of us had graduated, but that it was questionable whether there was the same difference now. That there was, and still is, I think, a difference in the average type of graduate, is generally admitted. This difference is largely due to the difference in the type of students which the two universities attract to themselves. Glasgow, drawing its undergraduates from its enormous local and surrounding population, with its commercial instincts permeating all classes and ages, has a more practical, hard-headed, future guinea-coining type of student, who gets what he wants—a practical, everyday, working acquaintance with his work, and who is generally very successful in getting his pound of flesh—(I speak figuratively in these days of coupons)—in after life. While Edinburgh, with its cosmopolitan atmosphere in a university with a world-wide *clientèle*, its obvious lack of commercialism, and less obvious, perhaps, devotion to the higher things of life, attracts students who get ingrained in them a more scientific aspect of medicine, and, I venture to think, higher ideals of its possibilities.

And it is the cultivation of this scientific spirit which has made Edinburgh what it has been, and it alone which will keep Edinburgh in the very forefront of the medical schools in the world; and it is this that I would plead for in the larger outlook when such a body as this is considering possible changes in the curriculum.

Moreover, it is essential that this scientific spirit should be inculcated in the general practitioner. It is *not* enough now, and will be still less so in the future, for this to be left in the hands of specialists in the big cities and hospitals. There was a definite idea twenty years ago that the days of the general practitioner were numbered, but the general practitioner is still with us, and I believe that much of any future advance in the science and art of medicine will come from the general practitioner. I take it that the ultimate ideal of medicine is prevention, and that of the general practitioner is prevention of disease as applied to individuals, or at least its recognition and successful treatment in its very earliest manifestations. It is in this direction that contract practice, such as mine, is potentially at least more ideal than ordinary practice. Now, after all, hospital practice is very largely concerned with the end-products of disease. Clinical methods at present consist in detecting the ravages of disease which has advanced to a point where definite physical signs are present, *e.g.* tubercle bacilli in sputum (*cf.* Army Regulations) in tuberculosis cases, and the only man who is likely to improve on this is the general practitioner who has the chance of seeing disease in its earliest stages and manifestations. To deal with this properly, and deal with the science and art of medicine, he must be imbued with the scientific spirit in his undergraduate days. There has been in the past too much reverence for authority and tradition. Let me instance only the British Pharmacopœia. How many of the remedies there have been officially admitted as the result of their scientific study, and what a field is there opened up for research. This, then, is the larger problem you must face if you are to improve the training of medical students.

But I come to more personal matters. The one large fact which stands out in my memory of early days is that I was quite incompetent to deal with very numerous cases of minor medical ailments which bulk so large in general practice and which do not fall under any definite heading in the text-books. Fortunately for myself, I have had experience in two medical schools—Dundee as well as Edinburgh; and I must confess that practically all my clinical work was learnt in Dundee, where students were small in numbers, and the teaching staff was younger both in years and in length of service than in Edinburgh, so that each student got an amount of individual attention from his teachers which was impossible under the existing circumstances in Edinburgh. In my hospital student days I was understood to write up three cases in the medical wards during the final winter session; it was difficult then to do this on account of the lack of clinical material in proportion to the number of students, whereas, during vacations, it was quite a common experience in Dundee Royal Infirmary to take half a dozen cases in a single evening. There, also, one spent a couple of hours every morning during the session in the side-room or medical out-patient department, encouraged to deal with the cases oneself, and only asking the opinion of the assistant physician or surgeon in special cases. This got one into the habit of dealing with individual patients instead of merely making notes on special diseases.

Another want which was noticeable during these early days in practice was that my knowledge of the *use* of drugs was very insufficient, though my mind was stored with innumerable facts as to preparations of an infinite quantity of drugs and their uses, committed to memory against the ordeal of an examination, and not yet, at that time, forgotten. Even then I felt that I had been the victim of too much slavish note-taking and cramming up these notes, always with the one ideal of "getting through the exam." I knew all about the articulations of the sphenoid bone, but could not treat an "attack of the bile."

My recollections of pathology were largely confined to a sort of pathological club which half a dozen of us used to hold informally after the pathological lectures to try and find out from each other what the lecture had been about.

I had, I think, managed to get through my course with only one attendance at the post-mortem room in Edinburgh. Clinical medicine was represented by the memory of the useless ward cliniques with seventy or eighty students round one bed, while the professor led us into "transcendental realms of physiology."

The most useful, and by far the most memorable, course in my student career was an extramural summer session of midwifery—a priceless course to me—by Sir Halliday Croom.

My time had been so much spent in cramming for exams. that I had had none left for the more or less optional clinical classes in hospital in the evenings.

Since these early days I have had many assistants from different medical schools, and, with two notable exceptions, I have seen the same things wanting in them as were wanting in myself. A young graduate is really of very little use as an assistant to a busy general practitioner for at least several months, though he is generally a "safe" man—not a very high ideal, though, perhaps, a very necessary one. The exceptions were one assistant who had spent two years as an unqualified assistant before graduation, and another who had been resident in Dundee Royal Infirmary, where during twelve months he had had resident charge, in succession, of *every* department, including out-patients.

In suggesting what might be done to improve the methods of tuition, it is a little difficult after twenty years' absence from university classes (for one must speak of personal experiences). But on looking over notes jotted down for these remarks daily for the past few weeks I find nearly every day the words "more clinical work"; "not enough contact with patients"; "use out-patient departments more"; "dispensary work." These are the things which tend to make a young graduate more useful. Actual *work* in these departments, not mere listening to clinical lectures, but *contact* with the patient, is what is, or was, wanted—all, of course, with proper and careful supervision. I do not think, for example, that anyone ever saw me percuss a chest while I was a student in Edinburgh. I certainly never had a *skin pencil*, than which there is no more valuable piece of apparatus in the training of a medical man. Its use is a constant governor in the way of accuracy, and pins one down to a definite expression of opinion in clinical work in a way in which nothing else does. I would make its use compulsory for all clinical clerks. Anyone who can at all accurately pencil out the limits of the heart, lungs, liver, will not go far wrong in any diseases of the chest.

And there is nothing like accurate clinical work for stimulating enthusiasm, keenness, and the scientific spirit, if it is properly overlooked. And especially should the lesions found clinically be correlated with the conditions found in the post-mortem room.

In all this, and for all this, it is essential that the teachers should not be too old. The loss of mental elasticity is fatal to the training of students. More use—much more use—should be made of the younger men, and *small* classes in clinical medicine and surgery, where each student can become expert in the methods of examination, are absolutely necessary.

So far as the actual curriculum is concerned, I have heard some who deprecated the amount of time spent on physics, botany, and zoology. I am far from that. I think they are invaluable in training the student in habits of accurate observation, and in giving him an introduction to embryology and a general sense of the theory of evolution. Chemistry, physiology, anatomy, and pathology are, of course, the fundamental sciences on which the art of medicine is based, and these cannot be interfered with without serious loss of efficiency. These lectures are not only valuable in themselves, but should also give the student the hall-mark of a university—a broad outlook, a capacity for observation, clear thinking, and an ordered judgment. I question whether the same can be said of the later courses. Take midwifery, for example, to which I have already referred. I learnt all that I knew in my student days at an optional summer course, while the obligatory hundred lectures have left no impression on my mind.

In the statutory courses in medicine and surgery more attention might be paid to principles and less to details, especially in the less common conditions — *e.g.* I knew, or thought I knew, most of the details of diseases of the nervous system when I graduated, most of which were quite unnecessary either for principles or treatment.

The lecture rooms for the last year at least—better, two years—should be in the background. The *hospital* should be the college during that time. The *profession* of medicine may be taught in the university—the *practice* can only be taught in hospital. The curriculum at present is a great improvement in this respect on the old one.

It has often been said that "medicine has to be learned over again when the student has left his medical school." No amount of book knowledge of the principles of treatment, or of the means and methods available, is sufficient of itself to make a good practitioner. He must be trained at the bedside, in the out-patient room, in the dispensary.

It is pathetic to see the number of medical men who never use a microscope, who rarely think of testing urine, and who could not make a blood-count if they tried. The habit of note-taking among general practitioners is practically moribund, and can only be revived by stimulation during their hospital career. I do not mean, of course, elaborate case sheets, but jottings of the more important points of special cases.

With all this, it is important to remember (what some teachers, I think, forget, especially when they are riding their favourite hobby) that a student is not in the university to learn all that is known about disease, but to learn *how to study disease* and *how to treat patients.* This constitutes the art of medicine and can only be learned by constant contact with disease as manifested in individual patients, and by the application to each of the *principles* of diagnosis, prognosis, and treatment based on previous knowledge acquired in the lecture room.

Only by such ways and means can we lessen the reproach of doctors, in the popular aphorism with its little sting of truth, that "they are men who pour drugs of which they know little, into bodies of which they know less."

LIX.—THE TRAINING OF MEDICAL STUDENTS FOR GENERAL PRACTICE IN TROPICAL AND SUB-TROPICAL COUNTRIES.

By JOHN M. DALZIEL, M.D., B.Sc.(Public Health),
D.T.M.&H.(Liverpool), F.L.S.

THE circumstances of medical practice in tropical and subtropical climates probably offer a much wider range of conditions than those of the general practitioner at home, but whether the graduate is destined to pursue his profession in the home country or abroad, his preliminary training as an undergraduate must be the same.

The special equipment of the student for medical work in warm climates is mainly provided by a course of tropical medicine and hygiene, and it is possible that many men have found in the School of Tropical Medicine, where the teaching is largely of a demonstrative and practical kind, the most useful part of their whole training. Such training stimulates a man to acquire for himself the habit of observation and some degree of personal interest in research, and I take it that it is just the sense of something lacking in this direction in the ordinary curriculum which is partly responsible for the present inquiry.

In considering the special circumstances of the man who is going abroad, we realise in the first place that the medical man in the tropics, as compared with the practitioner at home, is more likely to be thrown on his own resources in the matter of clinical pathology, and the most frequent of the simpler examinations coming within an average routine will probably be those of blood-smears and of fæcal matter. *Malaria* remains, in spite of the positive differentiation of several other forms of fever, the chief cause of pyrexia in the tropics and the one to be excluded first in differential diagnosis, and the practitioner who diagnoses every rise of temperature as *malaria* without examining the blood soon lapses into the slovenly habit of the mere prescription scribbler. And similarly the prevalence of intestinal derangements in tropical practice calls for the very frequent use of the microscope to detect protozoa or the presence of helminthic ova or blood.

I can vouch for it that in the tropics at least it is no uncommon experience to find men who seem incapable of spreading a decent blood-smear or staining a slide of pus, yet these details have been taught for years. As they have no doubt been learnt at the proper time and place, and then forgotten, perhaps a simple remedy is to insist that some laboratory technique is a definite and essential part of the *final* examination, and not to take it for granted that it is remembered from the class of bacteriology or the clinical tutorials.

In the second place, the general practitioner in tropical climates, and equally the officer in Government Medical Service or in medical charge of plantations or mines, inevitably acquires some bias towards preventive medicine, if for no other reason than that a large number of his cases for treatment will be cases of communicable disease, communicable through the agency of the lower forms of life. One need only mention those two most widely-spread diseases, *malaria* and *dysentery*, and add to them the infections due to *animal parasites*, to indicate how closely the medical man in the tropics must needs be brought into touch with the preventable diseases.

I wish, therefore, to review very briefly the special instruction in "Tropical Diseases and Hygiene." The course for the diploma includes "*Bacteriology*," a lecture course on "*Diseases of Tropical Climates*," a practical course on "*Medical Entomology and Protozoology*," "*Tropical Hygiene*," and six months' clinical instruction in tropical diseases.

1. The "Bacteriology" is the advanced course for various classes of students and those members of the class who intend to specialise.

2. Systematic lectures on "Diseases of Tropical Climates." The diseases which are peculiar to the tropics or which assume a greater practical importance in warm climates are numerous enough and important enough to demand a fairly comprehensive course of lectures, perhaps especially where the supply of clinical material is scanty or precarious. At the same time, the text-books on the subject are sufficiently good and sufficiently defined in scope to render it easy for the lecturer to limit his treatment of the subject and to guide the students in their reading, so that more time can be devoted to clinical and laboratory work.

In the Liverpool school, during the period when I took the tropical course there, the set courses of lectures were somewhat limited, so as to serve rather as a background to the more practical instruction in the laboratory, clinical material being also abundant. *Parasitology*, for example, was taught very largely in the laboratory, such aspects as classification, etc., being explained on the blackboard at the time the particular species were actually before the members of the class. There was also the advantage of experimental material in connection with the research work of the school.

On the other hand, at Liverpool some of the most valuable lectures were of the unrehearsed type, or at least unclassified and not scheduled on any programme. The Liverpool school was then much concerned with research (1) at the Runcorn Laboratory; (2) by scientific expeditions to the tropics for the study of important diseases such as *malaria*, *yellow fever*, and *sleeping sickness*. The class then had the advantage of hearing at first hand, whenever a suitable opportunity occurred, the men actually engaged in contemporary experimental research, and even at times of seeing their work or the experts fresh from the most recent scientific investigation of diseases in tropical countries. This more than compensated for any abridgment of the course of formal lectures.

3. The practical course of "Medical Entomology and Protozoology." Following the principle that training should be more on observational lines and intended to train the student to teach himself, it is obvious that the instruction most suited to this end and most likely to be of use to the practitioner in the tropics is this practical course. The enormous debt which is owed to medical investigation, largely along lines of zoological study, in making tropical countries more habitable to the white man, not to mention the stimulus to medical science in general, has brought the subject of medical zoology into the forefront of those subjects with which the practitioner in the tropics must be familiar.

The subject of *parasitology* used to be cloaked as a comparatively unimportant branch of *pathology*. For the student of tropical medicine it requires to be rehabilitated, and the three subjects—*protozoology*, *medical entomology*, and *helminthology*—linked up might be definitely labelled "*Medical Zoology*," a now really important branch of medicine.

Now, this branch is particularly one which lends itself to teaching by demonstration and observation, with the minimum of explanatory lectures, and with some guidance on the part of the teacher as to suitable literature.

It would be possible to reduce the systematic lectures at least to the extent of referring most of the diseases due to the *entozoa* to the practical class, retaining only a few lectures for the larger subjects such as *ankylostomiasis* and *filarial* infection, the former on account of the essential importance of the subject and the administrative measures required, and the latter on account of its varied pathological effects and their treatment.

In the next place, the practical class of "*Medical Zoology*" is thoroughly suited for acquiring proficiency and resourcefulness in simple laboratory technique with the minimum of apparatus, for learning how to observe and how to record results, and how to recognise and classify species. The knowledge in this branch which it is necessary to have and to make use of as practitioner or Health Officer is that he must recognise the animal (insect or parasite), he must know its life history, and he must have some acquaintance with its habits. Every medical man is to some extent a naturalist, and in the tropics zoological material—whether noxious or innocent—forms in more senses than one part of the very atmosphere of one's daily activities.

Practical methods which are at once exact and at the same time simple and easily carried out—such as preserving in their proper fluids pathological material or metazoal parasites, mounting insects securely, preparing permanent slides, or stained and unstained protozoal material from blood or bowel—these things, if taught to students of tropical medicine, do much to encourage original observation and to create an interest in research. And other results of such a practical interest are that it stimulates the observer himself to observe farther and to keep records, it furnishes material of interest, and possibly new to science, for the experts, and it supplies material at home for the instruction of other students to the obvious benefit of the teaching school. From this point of view, then, the class of applied "*Medical Zoology*" becomes the most important in the course, and I place upon it the highest value in supplying the medical man who is going abroad with the kind of knowledge which is most likely to be really required.

4. "Tropical Hygiene." As regards this subject we have to remember that in some respects ordinary practice in tropical towns has not yet outstripped to the same extent as at home the sort of preventive work which still largely occupies the time and energies of the Health Officer. It is otherwise at home, where the subjects of *child welfare*, *maternity* and *infant care*, *tuberculosis* and *venereal diseases*, *school inspection* and *industrial hygiene*, have not only come to the front as public health problems, but have arisen more from the work of the practitioner, and even of non-medical social workers, than on the initiative of the Medical Officer of Health. The requirements of the practitioner in this country are now less on the technical branches of the subject, such as drainage, sewerage, and water supply, and more on the side of the direct applications of *preventive medicine*, *infant welfare*, etc., while neither the M. O. H. nor the general practitioner, perhaps especially in panel practice, can afford to remain ignorant of modern sociological problems.

Comparatively few men going to the tropics equip themselves with a diploma in Public Health; on the other hand, the majority now take the special training in tropical medicine with or without the diploma, and for these the general course of Public Health in the medical curriculum is not inappropriate as an introduction, though probably it includes a good deal of matter which might be omitted without practical loss, or which is sufficiently or more suitably dealt with in the course of "Tropical Hygiene." This appears to be a very comprehensive one; it is mainly taught in the laboratory, and the parts of the course which are of first practical importance are the subjects of water supply, drainage, and disposal of refuse and nightsoil, destruction of disease-carrying insects and animals, general sanitation of native lines and camps, disinfection of clothing, dwellings, and ships. These are the matters most likely to be acted upon by the medical man in the tropics if his services are employed to some extent in active public health or preventive work of one kind or another, as they so often are. Provided that *bacteriology* is thoroughly taught in its proper course, the chemical aspects of water and food need occupy little time, but the practical applications of disinfection should be taught to all students by demonstration. Another subject in which some instruction is essential is disposal of the dead, a matter which is much more likely to tax the practical efficiency of the medical man in the tropics than at home.

Also practical instruction in the art of performing a post-mortem examination and in reporting it accurately is a necessary part of the equipment of every medical man. In tropical countries the man working in private practice amongst natives has, in most circumstances known to me, comparatively few opportunities to do a post-mortem, but it is quite otherwise with the medical officer in one of the Government services, where, having charge either of native troops or of a gaol, or of both, with, in larger centres, medico-legal cases, inquests on persons found dead, etc., he has quite commonly not only the opportunity but the necessity to do post-mortem examinations fairly often. I am glad, therefore, to see in paragraph 6 of the Regulations for the Diploma in Tropical Medicine and Hygiene that "candidates shall also be required to produce certificates of proficiency in the making of post-mortem examinations and in preparing reports on them." This forms part of the course in "Practical Morbid Anatomy," and it is very necessary that every student's knowledge should be practically tested before he graduates.

The preventive aspect of the properly tropical diseases—*malaria*, *yellow fever*, *dysentery*, *plague*, *cholera*, etc.—and with these we must of course include the *enteric* group—finds place in the lecture course along with the practical instruction in *medical zoology* and *bacteriology*. But there are other diseases which are not classed as tropical, but which have a much greater practical importance in warm climates than is generally supposed, *e.g. pneumonia*, the incidence of which seems to be almost directly proportional to proximity to the equator; *tuberculosis*, which is probably on the increase amongst native races in the tropics; *venereal diseases*, which are a universal scourge and which many a medical man may find to be the most frequent conditions he has to treat or prevent; and to these must be added the effects of *alcohol*. To the practitioner and medical officer in tropical and subtropical countries the prevention of these conditions is, or ought to be, a matter of the greatest concern. To the general practitioner at home the problem of *intemperance* and the subjects of *tuberculosis* and *venereal disease*, with their prevention, are of the utmost importance, whether in ordinary practice or whether he becomes to some extent a specialist by undertaking work on these lines under a sanitary authority.

Definitely applied special teaching of the prevention of these diseases of great social importance and of wide effect on public health is necessary for every student. Possibly a special lectureship in "Preventive Medicine" would find its best application here; it would fill a somewhat definite gap in the equipment of the general practitioner whether at home or abroad.

DISCUSSION.

Dr. Matheson Cullen.—I can speak from nearly twenty-five years of general practice, but of a kind different from that of Dr. Crerar and Dr. Dickson. Since leaving general practice I have had the opportunity of seeing general practitioners in other parts of Scotland and under different conditions to my own, and in reading the reports of the previous meetings in regard to the medical curriculum, I was specially struck with the fact that the speakers recognised that there was something amiss with the medical department, and were anxious to remould the curriculum to something nearer the necessities of the general practitioner. It is a step in the right direction that such courses as chemistry, zoology, and botany might be more evenly distributed over the course, instead of being taken at the beginning, for when the student comes to materia medica and pathology he has largely forgotten the general principles of chemistry, zoology, and botany. It seemed to me that first the elements should be given, and then, later, courses, such as parasitology and entomology, at the appropriate place.

I was pleased to see the importance of minor ailments emphasised. No matter how well the student knows about such conditions as pneumonia, he will find that in practice his chief work is to attend to patients rather than to doctor diseases. The out-patient department and the Dispensary seem to me to be the places where the general practitioner should get most of his training. The typical cases in the hospital are of course very important for the routine of writing reports and so on, but the scheme which has been suggested on the preventive side of medicine—the importance of which in its association with the public health is not sufficiently realised in the general course of lectures given in medicine—would bring the student to the end of his curriculum with a fixed and definite amount of the general principles to go upon, and a knowledge of the various diseases which he is most likely to meet. Though the curriculum proposed is likely to give us a better qualified general practitioner, you must go further if you wish to make that practitioner of the greatest value to the community. The fact must, however, be faced that no matter how good a man is when he leaves the school, when he gets into general practice he is faced with many difficulties—difficulties of time, difficulties which are inherent in the condition in which he has to make his living—and the consequence is that very often his future career is practically stereotyped upon the knowledge which he had at the moment of graduation. There is a tendency for the general practitioner to become a creature of routine, and it is difficult to get him interested in the scientific part of his work. The only way that that can be done is by making more popular and more attractive the student days of the future practitioner; because, after all, every man who enters as a medical student does not end his study with his student days. In a university such as Edinburgh the provision of classes which would be useful to the practitioner should form an essential part of the curriculum. Such classes would also be useful in showing the teachers what difficulties beset a man in practice. Here, again, of course, we come up against the question of ways and means. It is not always easy for men to get away for the necessary time. Whatever may be said with regard to a State service, *i.e.* a whole-time service, which is the only one which would be adopted if a State service is ever tried in this country, the men would have to be given a certain holiday each year, and I assume that every, say, three years they would get two or three months in order that they might be able to go back and refresh their knowledge and get a grasp of the new facts which had emerged since they last were before the medical school. In addition to that, it is quite clear that if you are going to continue the scientific interest of the individual you must give him opportunities. The Government has recognised that, and before the war they had set aside a very considerable amount of money in order to establish cottage hospitals in various parts of the country. There is no doubt that at the present time there are men here and there in the country who are doing excellent work in that way. With such small hospitals, where a man has the opportunity of studying at his leisure, where cases will be taken and notes kept, I think there is a future in the way of research before the medical profession such as one could not contemplate even a few years ago.

Dr. Norman Walker.—Dr. Crerar ought to have mentioned to the meeting that he is the leading consultant to Cumberland: the ordinary practitioners there would not see such a large number of cases in a month. (I was struck with the fact that the number of visits in June was bigger than the number of visits in March.) Dr. Crerar referred to the fact that it was not so easy to get assistants now. This is due, I think, to the fact which he alluded to—the Insurance Act. But not only that. The present generation is far keener on making money that the preceding generation. The young man to-day wants to make his money immediately. The opportunities of making money by the man himself are very much greater, especially in an under-doctored town: in Dundee, for instance, they have the greatest difficulty in getting clinical assistants in the hospital because the men can all make more money in the town. This is an unwise way to look at things, if they only knew it.

It is an unfortunate thing that clinical medicine and clinical surgery are separated as they are; I almost think that the solution of that is that we must get over our custom of confining our hospital teaching from 11 A.M. to 1.30 P.M. It is also absurd that the summer vacation should be so long as it is.

It is an unfortunate thing in general practice that one may be at one's most successful seven or eight years after beginning. There is not the same prospect of going on improving in general practice in country districts as there is for those of us who start to practise in town. Yet it is a remarkable thing how loth doctors are to move. The country doctors in Scotland are very good indeed: you will often find among them men whose work shows that given a wider sphere they would have been far more successful, and yet they cannot make up their minds to break away from their practice.

I do not profess to know much of what goes on at the Dispensaries nowadays, but I do know that there is not the same competition to get on the staff as formerly, and that there is not the same keenness to do work at it. I should be sorry to think that the Dispensary has rather taken a back seat.

Both the leading speakers referred to note-taking. One thing which depressed me in certain recent controversies was the constant complaint about the clerical work. No one can be a good doctor who does not take notes, but I do think there is something in our methods here which tends to sicken the student of it. Our case-taking is so long. The future practitioners should be encouraged to take *short* notes of *all* cases.

There is a certain amount of truth in Dr. Young's statement about the Scottish men. My observation on that matter is that in the universities the management is nearly always in the hands of the Professor of Anatomy and Physiology. He is the man who has his time at his disposal, and he tends rather to develop the scientific side of medicine, let us say to the advantage of that side. In the colleges the management is in the hands of the physicians and surgeons, and consequently in these bodies the attention is devoted pretty largely to the practical side. And that of course is greatly favoured by the fact that in England the student is encouraged to begin medicine with his first professional cleared out of the way by getting through it at school. This is a thing which ought to be taken into consideration when people are belittling the Scottish education—that it does deal rather more extensively than some universities with the practical subjects.

The difficulty with the general practitioner is the amount of work he has to do. He has such a tremendous amount of work to get through that it is very tempting to slack some of it. Somebody said once: "It is not true that there are too many doctors: there is not enough money for them." A doctor ought to be able to make an adequate living without having to do what many men must—see sixty or seventy patients a day. I hope things will be so adjusted that that will be impossible in the not far distant future.

Mr. Wilkie.—Remarks have been made as to the importance of teaching in the out-patient department and in Dispensaries, and on the fact that at the present day the Dispensary does not occupy the position it did some years ago. It would seem that the possibilities of teaching in the Dispensary might be very largely increased, and that something should be done to encourage research work, and particularly clinical research work, in the general practitioner. I would like to raise the question of making whole-time appointments for the Dispensaries in Edinburgh, with a view to improving the clinical facilities for research work and the teaching there by appointing men to the staff who have shown themselves to be successful general practitioners, and who have specially adapted themselves to clinical research work. Because if this clinical work in the Dispensary is as important as the two first papers brought out, then the Dispensary must be put on a very different basis to what it is at present.

It is a question for consideration whether a considerable amount of money should not be spent on making the Dispensary really suitable for modern teaching, and whether it would not be possible to make whole-time appointments of men who really have experience in general practice and in clinical research work.

Dr. J. S. Fraser expressed the opinion that we want whole-time appointments in medicine and surgery and gynecology and everything else.

Dr. Crerar said in reply.—Mr. Wilkie asked if the general practitioner would consider it a prize were he given a full-time appointment at the

Dispensary, he of course devoting himself to the clinical study of disease, especially along the lines of clinical research. That would depend largely upon whether the Dispensary is to be an integral part of the school. If it is to be kept in its present detached position, a full-time appointment to its staff will not be worth much. The school would require to bring the Dispensaries into much more intimate relations with the clinical training, and also with the examinations. And the same thing would apply to the out-patient departments. The Dispensary should be looked upon as giving an essential part of the training, and men should be appointed to the staff who would bear the same relation to the students as the clinical teachers in the Infirmary. Why indeed should not these themselves take some part in the teaching at the Dispensary?

Dr. Dickson said in reply.—Dispensary work is important, because it supplies an amount of clinical material which is not at present in Edinburgh supplied anywhere else. It gives the student the actual intimate contact with patients which he does not get in the larger hospital departments. For many years my type of practice was such that one could discipline one's patients considerably. My ideal is that medicine should be preventive, and a large amount of important work is done at the street corners talking to the mothers about the health of their children, and I encourage them to send for me *just before* the child is ill! When they realise they can get the doctor before they are ill, they do not trouble him much when they are seriously ill! So that that question of the immense amount of work of the general practitioner does not hold good after a certain number of years of practice.

Dr. Dalziel said in reply.—I should like to refer to one of the questions which came up in the matter of contemporary research, as it was brought to the notice of students of tropical medicine in Liverpool. From perusing the published reports of these meetings, I have gathered that one of the objects of the teaching is to stimulate the imagination of students and to create in them an interest in research. I believe that Professor Lorrain Smith's method of teaching morbid anatomy practically achieves this as far as that subject is concerned, and indirectly for the whole of medicine and surgery. Is nothing done to bring contemporary research in the teaching school before the notice of students? There seems to be a great deal of research going on in one department or another. I do not think that this should take up any of the student's time in a definite way, such as would be the case if a more practical suggestion were carried out, viz. to make student-assistants in any department where there is practical laboratory teaching, the object being that they should acquire familiarity with laboratory technique and some dexterity. It might be objected that this will be of no practical utility to the general practitioner; but apart from the immediate educational value of it, there would be a stimulus to the keen student, and even to the one less gifted with imagination, and it would bring the question of contemporary research before his notice as something real, and achieving actual results rather than as a thing quite remote from his current studies.

LX.—ON THE TEACHING OF OPHTHALMOLOGY TO MEDICAL STUDENTS.

By E. TREACHER COLLINS, F.R.C.S.

THE advantages to be derived from instruction in ophthalmology by medical students may be discussed under three headings:—I. The assistance which it affords them in the diagnosis and prognosis of general diseases. II. The capacity which they acquire of recognising and treating the commoner local affections of the eye, and in avoiding mistakes, which are not only disastrous in themselves, but which may add to the burdens of the community. III. The training which they receive in attention to detail and exactness of observation.

I. It is now nearly seventy years since Helmholtz invented the ophthalmoscope—since Graefe for the first time saw the background of the eye, with its nerve entrance and its blood-vessels, and jumped up, with flushed cheeks, exclaiming, "Helmholtz has unfolded to us a new world." This new world has, by the labours of many careful observers, been thoroughly explored and charted; yet it is a remarkable fact that for the majority of medical practitioners it is still a *terra incognita.*

Every medical student provides himself with a stethoscope, and devotes much time and patience to training his auditory faculties for its use. Comparatively few purchase an ophthalmoscope or make attempts to train their eyes to see the wonders which it reveals. For purposes of diagnosis the latter instrument is, in its way, just as valuable as the former. In proof of this I would put before you the following brief statement of information which may be obtained from an ophthalmoscopic examination apart from anything else:—

(*a*) That a patient has suffered from syphilis, or that a child has descended from parents who have suffered from that disease; (*b*) that a patient is suffering from tubercle, or that a meningitis of doubtful origin is due to tubercle; (*c*) that a patient complaining of headache and sickness has intracranial pressure, and is probably suffering from a cerebral tumour; (*d*) that a patient apparently in good health has "contracted granular kidneys," and will probably not live for more than a year; (*e*) that a patient is suffering from arteriosclerosis, and will probably die of cerebral hæmorrhage; (*f*) that an individual, apparently robust and well nourished, is suffering from glycosuria; (*g*) that a patient has aortic regurgitation, and has probably suffered from rheumatic fever; (*h*) that a patient who complains only of dimness of sight will ultimately develop locomotor ataxy or general paralysis; (*i*) that a child who has weakness of the back and who is thought to be rickety or marasmic is of Jewish extraction, and will shortly die of an affection of the ganglion cells of the brain and spinal cord; (*j*) that a man who has been passed for military service and graded for the fighting line is unable to see at night, and if put into the trenches, or on sentry duty, will be a source of danger to his fellows; (*k*) that a patient has an enlarged spleen and is suffering from leucocythæmia.

II. Medical practitioners of good standing often remark "that they do not dabble in eyes, but send at once any of their patients suffering from eye symptoms to a specialist." One is, moreover, bound to admit that, under the circumstances in which they are placed, it is wiser for them thus to confess their incapacity rather than to profess to deal with what they do not understand. This is not a position, however, which the rising generation of practitioners should be encouraged to adopt. The General Medical Council advocate, and many universities and other licensing bodies insist, on the attendance of a medical student at a course of instruction in ophthalmology before he presents himself for his Final Examination. After three months' diligent attendance in an ophthalmic out-patient department an average student, provided he has a good teacher, should be able to recognise and treat many of the commoner and less severe forms of eye disease. Knowledge so obtained will not only add largely to his reputation, and be of benefit to his pocket, but will also tend to decrease the overcrowding of ophthalmic out-patient departments.

There are some eye affections about which it is a medical practitioner's duty to be well acquainted. Anyone who practises obstetrics should know how to prevent, recognise, and treat ophthalmia neonatorum. It is a disease which is preventable and curable without loss of sight if taken in time, and yet it is the commonest cause of loss of sight amongst the inmates of blind asylums. This deplorable loss of sight, dating from infancy, which renders those affected a burden on the community for the whole of their life, is generally attributed to the ignorance of midwives. My own observations, extending now over several years, show that the culpable person is more often a medical practitioner.

The general and local symptoms of acute glaucoma cannot be too often dinned into the minds of medical students, so frequently is the eye affection, as the cause of the general disturbance in these cases, overlooked, and the time when active interference would save sight and relieve suffering allowed to drift away, hopeless blindness resulting.

III. Subjects are often included in an educational curriculum not only for their intrinsic worth but also for some ulterior object which their study is likely to effect. Thus the study of classics is advocated because it improves the student's powers of expression, and the study of Euclid because it stimulates the reasoning faculties. In the same way the study of ophthalmology is of value to a medical student, apart from its intrinsic worth, because it affords such an excellent training in precision and accuracy of observation. In this respect I claim it to be superior to that of any other branch of medicine. As, however, my opinion on this matter may be thought to be a prejudiced one, I will quote as an authority Dr. Hughlings Jackson, who said that "he regarded it as the luckiest thing in his medical life that he began the scientific study of his profession at an ophthalmic hospital, because he had there the opportunity of being well disciplined in exact observation."

Having thus summarised the advantages of a training in ophthalmology for medical students, I propose next to consider how best it may be carried out. The methods usually adopted are, as in other branches of medicine, by lectures and clinical demonstrations. Both as a teacher and examiner I have always considered the capacity for observation of greater merit than the mere remembrance of facts. For the training of the capacity for observation practical demonstrations and quizzing classes are far away better than systematic lectures. The former are indispensable to the study of ophthalmology; the reading of a good text-book may well replace the latter. Indeed, the reading of a good text-book is often preferable to listening to a bad lecturer. With regard to text-books, some American students at Moorfields' were much impressed when, on asking one of my former colleagues "which was the best text-book for them to read," he turned round, and with a dramatic wave of the arm to the crowd of out-patients behind him, said, "There, that is the best text-book."

What is most desirable in teaching is to show typical cases, and get their characteristic features firmly fixed in the students' visual memory, so that they recognise them at once when they see them again, recalling also associated facts which they have been told in connection with them respecting treatment, etc.

The value of clinical teaching, like the value of a course of lectures, largely depends on the teacher. No better judges exist of a teacher's capacities than the students themselves. Some years ago, at a large medical school, where the ophthalmic teaching was not all that it might have been, the students were in the habit of publishing in their journal facetious examination papers. One of the questions which they set was, "Write all you learnt in the eye department on the back of your visiting card."

All students should be encouraged to learn the use of the ophthalmoscope, for the reasons already stated. For this purpose every student should be advised to purchase an instrument of his own. The mere possession of an ophthalmoscope excites a desire to be able to use it, more especially if the expense to acquire it has been incurred by the owner himself. When I examined at the Queen's University at Belfast, we expected all the candidates for the M.B. to show their capacity of seeing the fundus of the eye with the ophthalmoscope. For this purpose we asked them to draw the arrangement of the retinal blood-vessels as they saw them emerge from the optic disc.

To attempt to teach medical students, as a body, to correct errors of refraction with spectacles is, I think, a hopeless waste of time. Some students show special aptitude for this class of work—I reckon about one in five. These should be encouraged and have facilities afforded them. The capacity to correct errors of refraction is a very valuable asset to a medical practitioner's capabilities. There is any amount of it to be done, and the only *raison d'être* for a "sight-testing optician" is the inability of the medical profession to undertake the whole of it. Uncorrected errors of refraction give rise to many aches and pains, for which much physic is prescribed, their real cause being overlooked. An old-fashioned general practitioner once remarked "he did not think much of this astigmatism which was so largely talked about nowadays. He had been in practice for twenty years and had never met with a case."

In conclusion, I would strongly urge that an examination in ophthalmology, conducted by those who have special knowledge of the subject, should be made part of the Final Examination for a medical qualification at all Universities and other licensing bodies. This has been the custom at the Irish universities and colleges for several years, and has more recently been adopted at Birmingham and Liverpool. For three years I examined in ophthalmology at the final M.B. at Queen's University, Belfast, and thereby came to realise what an additional stimulus such an examination was to students to work at the subject. In London no special examinations are held at its University or at the College of Surgeons. An ophthalmological question is occasionally set in the surgery paper. I know as a fact that the surgeons who are examiners have sometimes had to cram up the subject themselves before they are able to cope with the answers. Nothing is so unfair and unsatisfactory for candidates as to be examined by those who are imperfectly acquainted with their subject.

LXI.—THE PLACE OF OPHTHALMOLOGY IN THE MEDICAL CURRICULUM.

By FREELAND FERGUS, M.D.

For about thirty years I have been engaged in teaching medical students the elements of ophthalmology, and indeed I believe that I have taught more students the elements of that subject than any man who has ever lived in the West of Scotland. I do not think that any part of my strictly professional work has been more interesting to me, and therefore I hope I am not presumptuous in thinking that I am entitled to say something about the place which ophthalmology should have in the training of the present-day medical student. The time at the disposal of the modern medical student is far too short to teach him ophthalmology. No attempt should be made to go beyond those beggarly elements which are essential if he is to be made a reliable and, from the point of view of the public, a safe practitioner of the healing art. The attempt to teach everything in a very limited space of time only succeeds in making quite certain that the student learns nothing. Any attempt to overload the ophthalmic course, which at present is confined to twenty meetings, will be not only foolish but disastrous. A teacher of the subject ought to make an endeavour to instruct the pupil in those parts of the subject which are essential to every practitioner. The student ought not to be taught so much the treatment of ophthalmic cases as he ought to be made familiar with the light which ophthalmic methods of examination throw upon other conditions. You cannot teach much of such a huge subject in a matter of twenty lessons. No doubt this limitation is a very absurd arrangement—nearly as absurd as the syllabus of the Triple Qualification Board in Physics. There has recently been a re-issue of that document, and I venture to say that no man of average ability could master the subjects therein specified in a shorter course than one of two years.

When I was a student in Holland I found that ophthalmic studies were very much more prominent in the training of medical students in that country than they were or are in our own. During three years of his course the Dutch medical student had at that time to attend a certain amount of ophthalmic instruction which was very largely clinical. Personally, when I was teaching large classes I regarded the twenty meetings as totally inadequate, and as a matter of fact the class met on four days a week during a ten weeks' session, giving, roughly, about forty meetings, or twice the amount demanded by the Regulations. Of that course one-half at any rate was devoted to clinical work and the other half to lectures. The first half was almost entirely a clinical course and included diseases of the conjunctiva and cornea; diseases of the eyelids and lachrymal passages; diseases of the uveal tract, including iritis, choroiditis, glaucoma (at that time I thought I had some idea as to the pathology of glaucoma, at present I have got rid of any such notion); cataract; diseases of the retina and optic nerves. Every effort was made to illustrate the relationship between local conditions of the eye and systemic disease. I have never conducted a clinic without laying special stress on the study of diplopia, for I regard this subject as being of very great importance to all classes of practitioners. Every student was also trained in the examination of pupillary reflexes.

The second half of the course, which half formed the subject of lectures chiefly, with, of course, a little clinical practice as opportunity afforded, included the following:—First, white and coloured light, with a fairly extensive description of the phenomena of reflection and refraction, and a discussion of lenses and prisms as remedial agents. Second, the refraction of the eye. Third, range of accommodation, both absolute and relative. Under this last heading was also given a short account of the metric angle and of the relationships of the range of accommodation to convergence in emmetropia, hypermetropia, and myopia. Fourth, the sense of sight divided into (*a*) the sense of form and visual acuteness; (*b*) the sense of colour; (*c*) the sense of light; (*d*) the sense of projection; (*e*) the estimation of distance. Fifth, the field of vision for white and coloured lights. In this section perimetry and hemianopia were both discussed. Lastly, the affections of the extrinsic ocular muscles, including squint. That may seem a very ambitious course to be undertaken in forty meetings—twenty clinical and twenty lectures. In addition to that, numerous exercises were always prescribed on the physical part of the subject, and a very large number of the students took part in this voluntary work. Now I do not argue that a course of this kind, limited though it be, is one adapted for all medical students; I know it is not. You cannot make ophthalmic specialists in twenty meetings of a class—the minimum number required by the present ordinances; and the question then comes to be, What information in a short course can you give that will be of advantage in after-life? And here let me once and for all enter my protest against two things. The first is that the student should receive only twenty lessons in such a very important branch of his training. It is far too short. The Dutch limit is a much better one. I wish also to enter a very firm protest against an abuse which has in some places crept in, namely, the substitution of pictorial representations, either by diagrams or by lantern projection, for actual clinical work. The ordinances have shown a development in the right direction. At least fourteen of the twenty meetings of any qualifying class must be clinical, that is to say, I presume, they must be held in a hospital or in an ophthalmic clinic, for the purpose of examining patients, and not in a lecture-room. If a student has attended lectures these will, to the extent of six, count in making up the twenty attendances. Thus the ordinances give prominence to the idea that the courses for general practitioners as distinguished from specialists must be essentially clinical, and therein I think they are quite right. I wish, however, that they had gone much further and made the clinical training in ophthalmology a more extensive one. I imagine that if it were found that a particular course was largely or predominatingly a lecture course and not actual clinical work that that course would, if the question were raised, be found not to qualify for medical graduation. Not long ago I came upon some students who had passed through their ophthalmic course but had never used an ophthalmoscope and had never even seen it employed by anybody else. They had, on one or two occasions, been shown pictures of the fundus, but that was all. Such a course seems to me a farce. It is a pure contradiction in terms to call a performance of that kind clinical work. So much for the negative side, and now for the positive.

What, going on my own experience, such as it is, do I regard as the subjects which should be taught in a clinical class of ophthalmology to men and women who are going to undertake the responsibilities of the profession of medicine in general practice? Tuition in ophthalmology I think has a twofold object. In the first place the student ought to learn the signs and symptoms of the more important ophthalmic diseases. He ought also, so far as is practicable, to study those which are symptomatic of diseases of the general system; and lastly, and very importantly, he ought to be able on leaving his ophthalmic course to use such instruments as are of special value in investigating diseases of the eye, particularly of those diseases which are related to systemic ailments. To speak quite plainly, I would not let a man enter the medical profession unless he could use an ophthalmoscope almost with the same facility as he uses a clinical thermometer. These are the ends and objects which I steadily kept in view in dealing with students, and the rest of this short communication will simply be an elaboration of this aspect of the subject.

Personally, I would not regard a man as fitted to enter the profession of medicine unless he could use an ophthalmoscope to examine the fundus. And here again I would limit my ambition. It is the use of the ophthalmoscope as an instrument of medical research rather than of ophthalmic investigation that is of importance. I think an effort should be made to teach the student to recognise the healthy optic nerve and to know optic nerve hyperæmia, optic neuritis, and optic nerve atrophy when he sees them. I would also make quite sure that he could recognise retinal hæmorrhages and the various features which are characteristic of retinitis albuminurica. It would be well also that he were able to recognise a case of choroiditis. Further than that, I would not insist on his knowing much of the ophthalmoscope. He ought, of course, to be able to examine the crystalline lens as to its transparency. It must be remembered, however, that as the ophthalmoscope is an optical instrument a student will be at a great advantage if when using it he has a certain knowledge of physiological optics. It is not a very difficult matter to impart to him the required amount. Just start with a statement, as I generally do, that when a person sees a portion of the fundus of an eye which he may be examining, that portion and its image on his retina must be conjugate foci. A few minutes with a blackboard and a piece of chalk in a lecture-room some morning will teach a student all that he needs to know of this matter. Incidentally there will be brought before his notice the various conditions under which the patient's retina and his own may not be conjugate foci, and the student will be gradually led to see how these hindrances may be removed by the use of appropriate lenses. And thus the teacher incidentally gives the student all the elementary instruction which I think should be imparted as to the essential nature of emmetropia, hypermetropia, and myopia. I always introduced the study of the refraction of the eye in connection with ophthalmoscopic examinations. The definitions which I have given for many years are as follows:—If a portion of the retina be the source of light, luminous by reflection, the pencils emergent from the cornea are approximately parallel in emmetropia. Under the same circumstances, in myopia, the emergent pencils are convergent, while in hypermetropia the emergent pencils are divergent. At once the student sees what is required to overcome the divergivity in hypermetropia and the convergivity in myopia. No attempt should be made in the ordinary clinical course qualifying for graduation to endeavour to make the pupil an expert refractionist. It cannot be done in the time at his disposal, and all that you will manage is to take his attention away from work which concerns general practice much more closely. I have had special courses for instruction in refraction-testing and in the making of other physical measurements, but these matters, I think, should be rigidly excluded from a course specially destined for those who are going to be general practitioners. A mere indication of the methods employed should be all that is given. I regard it as entirely wrong to make any considerable portion of the clinical work which the student must do, under the present ordinances, refraction-testing.

As indicated above, I always take care both in the lectures and in the clinic, particularly in the latter if suitable material be available, to instruct students as to the examination of persons suffering from diplopia. It would certainly in an elementary course be a mistake to dwell on the binocular field of fixation. I do not think that it is even justifiable to treat at any length, if at all, of the measurement of the positive and negative ranges of convergence, but I do say that a man would be failing in part of his duty if he did not teach a student the differential diagnosis of diplopia so that the muscle, or group of muscles, affected by the lesion may be well ascertained. I have never found any difficulty in teaching students the study of diplopia in terms of rectangular co-ordinates. Modern medical students all but invariably have some acquaintance with the elements of co-ordinate geometry. It lightens a student's work immensely if he is told that the fixation point is the intersection of the abscissa with the ordinate and that the position of the false image may be resolved into horizontal and vertical components. Moreover, such a method of presenting a case allows the observer to estimate from time to time what progress is being made by the patient, for at a constant distance the value of the vertical and horizontal components can of course be ascertained as often as may be deemed necessary. For my elementary students I always have divided cases of diplopia into two groups, namely, those in which there is no vertical component, or, at any rate, one that is negligible, and those having a marked vertical in addition to a horizontal component.

I think it is also necessary to detail the chief facts as regards the development of strabismus. There can be no doubt whatever that in most cases of ordinary concomitant squint occurring in young children the onset of amblyopia in the squinting eye can be prevented and good vision insured for both eyes by rational and timely treatment. I imagine there is no ophthalmic surgeon of any experience who has not often met cases hopelessly and permanently amblyopic in which the patient, when a young child, was taken to a general practitioner and his parents or guardians told that it would come right as the child grew older. The intelligent exposition of a fallacy such as that cannot but be of service to the public. I have always found it most easy to explain squint, for I start with the definition that when the visual axes do not intersect at the point of fixation then there is squint. From that it is very easy to detail the factors which may cause a want of intersection. I think it would be improper to elaborate to any extent the study of muscular anomalies in a course specially destined for general practitioners, but a careful explanation of the damage that will inevitably be done by neglect in the case of concomitant squint in a young child would lead all conscientious general practitioners to take proper measures when they are brought face to face with such a contingency.

It goes without saying that all medical practitioners should be taught carefully and well how to test pupilary reflexes.

It is equally true that every medical student should be taught how to take the visual acuteness. Personally, I think Landolt's test is much the best, but it does not seem to have caught on either in this country or in the United States of America. It has many advantages, an especial one being that it is equally useful for the literate and illiterate, for those who know the Roman characters, for those who only know the Hebrew or Teutonic characters, and for those who know none. It is a universal test suited for every intelligent member of the human race. It is almost absurd to have to say it, but every medical student should be warned that in stating a visual acuteness he should invariably say, visual acuteness admitted is so and so. That is all that he or anybody else, apart from the examinee, knows of the matter.

I would not, in an elementary course, give any attention to the various methods of testing the light sense. No doubt that is a matter of considerable importance, but I do not think that any general practitioner is likely to have the apparatus necessary to carry out such an investigation. Probably, although not so certainly, the same line of argument applies to the testing of the colour sense. That is a very special part of ophthalmic work. Investigations of the colour sense, however, do not as a rule throw much light upon disease, except perhaps in the well-known case of central colour scotoma occurring in such conditions as tobacco amblyopia, and the occasional case of transposition in the field of vision of some of the colours in cerebral tumour. These are matters which may, however, very properly be discussed under the heading of perimetry.

There can be no doubt whatever that every medical student should be fully instructed in the methods of using a perimeter both for white and coloured lights. It is an instrument which gives valuable aid to the physician, to the surgeon, to the ophthalmic surgeon, and to the general practitioner. I do not perhaps lay the same stress upon teaching a student the use of the perimeter as I do upon teaching him the use of the ophthalmoscope, but it is an important instrument, with the use of which students should be made thoroughly familiar. It is perhaps quite true to say that there is no modern text-book on medicine where the perimeter is not mentioned. The same is largely true of text-books on surgery, which facts are tantamount to an admission that the instrument is of extreme importance in the examination of a large variety of diseases.

In the public interest I would lay special stress on a student acquiring a competent knowledge of the appearances and symptoms characteristic of glaucoma, both acute and chronic. Many an eye has been lost because a young practitioner has failed to realise what he is dealing with. There is no ophthalmic surgeon of the older school who has not seen that again and again. A case may be, by a practitioner who has been ill trained, carelessly diagnosed as incipient cataract, and special advice may not be sought till it is much too late to be of any practical value. On the other hand, an intimate knowledge of the particular features of glaucoma would often lead a practitioner to hold his hand before using a mydriatic. I, for one, think that every student should be warned of its danger and should be sufficiently instructed by the practical examination of actual cases to know the disease when he sees it. No doubt there are many interesting points in the discussion of the pathology and treatment of glaucoma, but surely that is scarcely the thing to give to an undergraduate in medicine.

Wounds of the eyeball will certainly be seen by the student during a good clinical course. He ought to be informed as to the danger of wounds of the eyeball in their connection with the possibility of sympathetic ophthalmitis. He ought to be taught the treatment of simple wounds of the eyeball which are not complicated by the presence of a foreign body in the eye, and he should also be carefully instructed as to the diagnosis of foreign bodies in the eyeball. Certainly, wounds of the eyeball should be properly brought to his attention, but unquestionably the best way of doing it is to let him see them as they occur in the ordinary clinic. A student will learn far more in a clinic where several cases of eyeball wounds may be seen daily than by spending a month or two in reading or in hearing lectures about them. Lectures as a method of teaching a clinical subject are an entire mistake.

Little remains to be said except regarding those diseases which are usually called externals. I refer to the various forms of conjunctivitis, diseases of the cornea, iritis, and diseases of the lachrymal passages and to those of the annexa of the eye.

Thirty years ago, acting, as I believed, in the best interests of the public, I wrote a letter to Dr. J. B. Russell, then Medical Officer of Health for the City of Glasgow, saying that both ophthalmia neonatorum and trachoma should be made notifiable diseases. I got back a letter to say that he saw no occasion for any such action. Within recent years they have very properly come under the auspices of the Public Health Authorities. That means that they are both a danger to the public health. Students should, in the public interest, unquestionably be taught the diagnosis of such diseases, and that from the actual inspection of cases and not from text-books or pictures. Further, the other common forms of conjunctivitis should be illustrated by suitable cases. I do not say accurately diagnosed, for the diagnosis of most cases of conjunctivitis depends on the oil-immersion lens. In 1891 I introduced into my own clinic the rule of having all cases on which it was proposed to operate competently investigated by a bacteriologist. Since that day I have not seen a suppuration after cataract extraction. I have seen one after a needling. Shortly thereafter, my colleague and friend, Dr. Lewis M'Millan, took up the subject in the ordinary everyday clinic, and thus from 1891 the oil-immersion lens has been used daily for all cases of conjunctivitis. You cannot possibly expect a general practitioner to examine conjunctival secretion, notwithstanding the fact that it is a vastly important investigation. That is no reason, however, why he should not be taught to recognise ordinary conjunctivitis and the differentiation of that condition from ophthalmia neonatorum, from trachoma, and even from that special form which is still, for the most part, called phlyctenular. I always insist that a student shall realise that a conjunctivitis is a septic infection of the conjunctival membrane. The microscope or cultures may show him, if he has time to apply such methods of research, what particular organism he is dealing with, and it may well be worth his while to take pains to make such inquiries, or to have them made for him, but not for a moment should he lose sight of the fact that an inflamed conjunctiva, like inflammation of any other mucous membrane, is most frequently micro-organic in origin and must be treated on precisely the same principles and from the same point of view as any other inflamed mucous membrane. No application of a so-called antiseptic is of the slightest avail, for, up till now, we have not found anything which may be said in general terms to kill the organism without at the same time killing the corneal or conjunctival tissue. The only exception to this general rule which occurs to me just now is the influence which zinc sulphate undoubtedly has in the removal of the Morax diplobacillus. One point should always be emphasised, and that is that a case of iritis is apt to be mistaken for acute conjunctivitis. I invariably make students, in the presence of a case of ordinary catarrhal conjunctivitis, examine the pupilary reflexes. Most cases of iritis can be treated perfectly well by a general practitioner, excepting those in which there are great oscillations in tension; such cases should be in the hands of an ophthalmic surgeon.

Regarding iritis, the important point to get the student to realise is that it is not primarily a disease of the iris but is the expression of an infection. The first duty of the practitioner in charge of such cases, be he a general practitioner or an ophthalmic surgeon, is to find out the nature of the infection. That is the first step towards treatment. Thus inflammation of the iris, while forming a condition which requires the closest attention of the practitioner who may be attending the patient, sometimes throws considerable light on other diseases of which the patient is the victim.

As regards the cornea, there are some conditions which I would insist upon a student knowing—ulceration with or without hypopyon, suppuration, interstitial keratitis and cicatrices, such as nebulæ or leucomata resulting from local diseases of the membrane. A student certainly ought to be instructed as to how to diagnose ulceration of the cornea and interstitial keratitis. Here, again, the oil-immersion lens may come into use. On one thing I am quite clear, and it is that the oil-immersion lens is sometimes of particular use in prognosis. Given a pneumococcal infection, the prognosis is much more grave than in many other conditions. The plain fact is that the practising physician can, if he likes, get the greatest possible assistance in the way of accuracy of work from modern pathology. I do not say that I would insist on every student who is going to be a general practitioner going through a special course of ophthalmic bacteriology: certainly not. It would be wrong to occupy any large proportion of the time at the student's disposal with any such study, but if a student attends a good clinic for some months he cannot but pick up some knowledge of ophthalmic bacteriology from the everyday practice which he sees, and, further, it is satisfactory to know that the present-day medical student receives competent training in bacteriological work in his pathological course and therefore has little, if any, need of special training in ophthalmic bacteriology.

No lasting or definite progress is likely to be made on anything else than a strictly scientific basis. Ophthalmology in its true sense ought to be the practical application of physics, pathology, and physiology, with something also of the therapeutic art.

LXII.—THE TEACHING OF EYE DISEASES IN THE CURRICULUM.

By WILLIAM GEORGE SYM, M.D., F.R.C.S.

As the matter presents itself to my mind, the principal danger to be avoided is the tendency to teach the subject of diseases of the eye (and all such special subjects) as separate entities and not as departments of medicine and surgery, and to inculcate in the student a specialist's knowledge rather than a general practitioner's knowledge of the subject. Notice that I speak meantime of the student proper. I ought—I wish to speak for myself, not to preach to others—to regard my class-teaching as a portion of the class-teaching of surgery; the general surgeon cannot overtake all the branches of surgery (for more reasons than one), and to him is relegated general surgery, to me the ophthalmic aspect of surgery, to another the gynecological, to another the aural. I am not expected to teach the more erudite developments of ophthalmology to the student, nor is it desirable that I should endeavour to transform him into an oculist before he has even become a licensed practitioner of medicine and surgery. That, in brief, is what I look upon as my duty from the negative point of view; from the positive, it is to teach him such portions of the subject as he is likely to require to know in any circumstances, such as he might meet with on the day on which he goes into general practice, leaving for further study the more precise and intimate details of examination, of work, and of investigation. Let me give a simple example: I endeavour to instil into the student an understanding of what the expression "error of refraction" signifies, of the reasons for which such error is of high importance in the economy of the eye itself and in that of the general health, of the signs and symptoms which point to such a condition, and of the more ordinary means by which such error may be recognised, measured, and treated; but I do not bamboozle a man who has still to pass his Final Examination in medicine with details as to the first principal point of the eye, or the theory of the ophthalmoscope, nor do I expect him to be able to estimate with precision the degree of fault in a given case.

I therefore agree in the main with the sound good sense of the authorities who have restricted the various teachers in regard to the frequency of attendance on lectures and demonstrations, and to the scope of the teaching—that they may make sure that on the shoulders of an already heavily-weighted student a burden is not laid which he is unfit to carry. The course of twenty-four lectures and demonstrations, with a little tutorial instruction in the ophthalmoscope, is, I think, neither too short nor too long for the purpose. As to the ophthalmoscope—using that instrument as an example of several, the mode of employment of which ought to be more or less familiar to the student—what is the right course? It is obvious that to become an expert a man would require a great deal more instruction than it would be right to inflict upon him in a class adapted to the needs of *every* student. The average practitioner, even one in general practice, rarely, I think one might say almost never, uses an ophthalmoscope, but I do not consider that when one has said that one has closed the question, for if he were better able to employ it perhaps he would more frequently do so. Still, when all is said and done, the ophthalmoscope will remain, nineteen times out of twenty, a specialist's instrument, simply because the efficient use of it demands incessant practice, and that is what the family practitioner cannot give to it. I consider our present plan quite a suitable one: we teach the student how to use the instrument, to do so sufficiently to understand how the tool is worked: its more intimate manipulation he must postpone till after graduation.

The weak point about the present teaching arrangements is this: I consider that with the class recurring during each of three sessions per annum, one is so kept at the grindstone that there is neither time nor strength for higher teaching in the subject. (Of course during war time there are no post-graduates to teach.) I wish it could be arranged that during two of the sessions one of the colleagues lectured and he was set free for senior work in the third, and similarly that the other had senior teaching during one session (not the same session as his fellow), and taught students in the other two. That plan would give quite sufficient facilities, I should suppose, for the students, and yet would afford some relief, some variety, some encouragement to the teachers themselves.

Another point on which I must dwell for a moment is that of the examination. No teaching of ophthalmology can be satisfactory unless the student is subject to examination.

> The fear o' hell 's a hangman's whip
> To haud the wretch in order.

We have allowed some other universities to get before us in this matter; for years I have been examiner in ophthalmology for the Final Examination in Medicine, first in the Royal and now in the National University of Ireland. At one time it was considered sufficient in our own university that when he was passing through the sieve of clinical surgery the candidate should be shown a patient from the eye department and asked for a diagnosis by the ordinary examiner in clinical surgery. When I became university lecturer I declined to have any dealings with so palpable a fraud, and refused to supply from my wards patients for the surgeon to employ in the examination of students. These, probably, being fresh from a class on diseases of the eye, knew a good deal more about the matter than the examiner, who never dealt with such cases in his practice from year's end to year's end. I consider it eminently desirable that the student should be examined in the subject, but the examination should be a fair and honest one.

The plan which has been hit upon for the avoidance of the difficulty is that our class certificates are held to indicate that the student's knowledge has been found to be sufficient to allow him to escape further examination in that particular subject. I consider this plan quite unsatisfactory, first because it violates the principle that no candidate should be rejected in any subject except by the agreement of two examiners, since it throws upon the teacher alone the responsibility of passing or rejecting; and secondly, because that mode of dealing with class certificates is limited to these subjects. Would the physicians, may I ask, be satisfied that a class certificate (popularly known as a "D. P.") of attendance at Dr. Z.'s class should clear a man from any examination on practice of physic as an integral part of his Final Examination? Why then should this be done as regards diseases of the eye and of the ear?

I have suggested before, and now suggest again, a method by which the difficulty may be got over; that to examine every student in diseases of the eye, the ear and throat, and in diseases of children, would entail a heavy strain on the candidates, and a serious increase in the cost of the Final Examination. My plan is this: Let it be assumed for the moment that each candidate is at present examined on three patients in clinical surgery. Divide the candidates into five groups of equal numbers—A, B, C, D, E—by lot, or in any other manner which would completely obviate any candidate knowing until the day of his examination into which group he fell. Every candidate would now have two cases in clinical surgery, and those in sections A and B would have three, and they would have no "special" subject; those in section C would have two clinical surgery cases and be sent to the eye department for their third; those in sections D and E similarly with diseases of the ear and throat and children's diseases. Thus every candidate would require to be ready in every subject, yet the actual examination of any one would be limited, the labour curtailed, and the examination be conducted by a person really familiar with the subject in which he was an examiner.

What value, for examination purposes, ought to be placed upon the special subject? I do not suppose that anyone would suggest that, should a candidate do well in clinical and systematic surgery he should be stopped altogether if he came down badly in eyes or in throats, but such a contingency very rarely happens in my experience elsewhere. If a man is good in surgery he is at least fair in ophthalmology; if he is bad in ophthalmology he is no better than very moderate in surgery. In the university in which I examine, the value of ophthalmology, relatively to surgery, is (I must not give away secrets) in the proportion of something like one to four or so. It is so adjusted that the risk of a good surgeon being stopped because he is a bad ophthalmologist is reduced nearly to zero when the values are added, and also that a good ophthalmologist may have a figure or two to spare to help to keep his feet clear of the bar in the larger subject. In practical experience it is not found to be true that that favourite bugbear of the general surgeon is of any real importance, the danger, namely, that the specialist may rate a knowledge of his subject too high and expect too much of the candidate. Such an error is not found to exist. In speaking thus of numerical values I speak in complete ignorance of the methods used in the Final Examinations here; that is a matter regarding which I have never made any inquiry, and I have no information whatever. But in the estimate of a man's position in reference to knowledge of his work, to justify his receiving or being refused licence to practise, a moderate acquaintance with these two branches of surgery, eye and ear, ought to have a definite value, and to have it because they are parts of a big subject, parts which in point of fact *are excluded* unless they are in some such way included. For one must recognise that the so-called general surgeon is a specialist in his own portion of surgery just as I am in mine; his scope may be wider, but the essential fact is the same in both instances.

LXIII.—THE TEACHING OF DISEASES OF THE EYE TO MEDICAL STUDENTS.

By J. V. PATERSON, F.R.C.S., Ophthalmic Surgeon, Royal Infirmary.

SPEAKING as a teacher of considerable experience I would consider the following points of special importance :—

1. When should the students attend the class on eye diseases?

2. How much of the subject should they be taught, and what time is adequate for the proposed instruction?

3. Should the student require to pass a qualifying examination, and what should be the type of examination if such a test is made compulsory?

As to 1, I am very strongly of opinion that the students ought to be as far advanced as possible in their study of general medicine and surgery before they begin the study of eye diseases. If they have not a reasonable knowledge of these subjects the teacher is necessarily at a great disadvantage and many of the most important clinical facts in ophthalmology cannot be seen in their proper bearing and perspective, *e.g.* changes in the pupils, optic nerve and retinal changes depending on diseases of the nervous system or on circulatory or renal trouble. Diseases of children should also be studied before eye diseases, as eye conditions of great importance occur so frequently in children and local treatment is so often of secondary value when compared to general re-establishment of the child's health.

2. What should students be taught? They must be taught to recognise the commoner eye ailments, to know what cases they can safely and efficiently treat and those which they ought to send promptly to an eye hospital, or to a specialist for consultation. The making of a diagnosis implies thorough training in how to examine an eye and how to note the points on which diagnosis is based and estimate their value.

The anatomy and physiology of the parts have usually to be re-stated from the clinical point of view. Teaching must be mainly clinical and the students must closely examine a large number of cases so that they have a good opportunity of becoming really familiar with the common external eye diseases, as, for example, conjunctivitis, hypopyon ulcer, phlyctenular keratitis in a child, interstitial keratitis, iritis, cataract, glaucoma, squint. Injuries of the eye form an important group of cases and must be dealt with in considerable detail.

In dealing with the question of defective vision after injury the teacher should, in my opinion, do his best to enlighten the student on the question of visual efficiency in workmen.

Certain of the more abstruse conditions on which great stress is laid in many of the text-books should, in my opinion, not be discussed in any great detail. A good example of this is the differential diagnosis of the various muscular palsies.

In the case of medical students it is enough to demonstrate a case of diplopia and to call their attention to the significance of diplopia in medical diagnosis.

With so little time at his disposal I do not think the wise teacher will show his students a large number of the major eye operations, but a few typical operations should be shown in order to indicate to the students the scope and therapeutic result of operative treatment on the eye. Minor operations on the lids, tear passages, etc., will be of daily occurrence in the out-patient room, and with the technique of these the student should have the opportunity of becoming thoroughly familiar. A certain amount of systematic instruction must be given in order that the student may be able to piece together what he has learned from the cases demonstrated and so obtain a clear idea of the subject as a whole.

The programme of teaching so far indicated seems varied and somewhat lengthy, but, given plenty of material, the teacher should be able to overtake his subject in a single term with meetings three times a week, *i.e.* about twenty-seven meetings in all.

The size of class that can be efficiently dealt with when so much of the teaching is done by demonstration of actual cases will, in my opinion, be limited to forty at most.

So far I have not spoken of a part of the teaching quite as essential as that which I have been discussing. I refer to the training in the use of the ophthalmoscope. For this training the students attend tutorial classes in the evening in sections of eight to twelve. Each section meets six or seven times, but the number of meetings might with advantage be increased to eight or nine.

No part of the body affords so good a field for accurate clinical study as the fundus of the eye, and training in the use of the ophthalmoscope has, in my opinion, a very special educational value for the student apart from the help in diagnosis which it may afford him in his work as a practitioner.

In these tutorial classes the students also receive elementary lessons on errors of refraction and in the method of estimating and recording the amount of a patient's vision. The methods of taking and recording the field of vision are also demonstrated.

No attempt whatever should, in my opinion, be made to teach the students how to prescribe glasses, as this can only be learnt by long practice in an eye clinic.

This tutorial instruction should be made compulsory.

With regard to the special conditions prevailing in Edinburgh, there is no doubt that the teaching in the eye department would be improved if freer use were made of the help of the assistant surgeons. In the absence of the clinical tutors on war service, Dr. Traquair has been good enough to undertake the tutorial teaching, at great personal inconvenience. In normal times, when the number of medical students is much greater than at present, the assistant surgeon should certainly have a share in the teaching of the students, more especially in the demonstration of cases to the students in smaller groups.

3. With regard to the question of examination, I would be content if the students were made to realise that they cannot be granted a class certificate by the teacher unless they really have a satisfactory knowledge of diseases of the eye.

The present method of demanding 30 per cent. on a class examination paper seems to me to be something of a farce and a higher standard should be required. An adequate test of a student's knowledge would, I think, be best made by a written paper followed by a short oral examination.

LXIV.—DENTAL SURGERY FOR MEDICAL STUDENTS.

By WILLIAM GUY, F.R.C.S., L.D.S., Dean of the Dental School.

In discussing very briefly the question of including dental surgery in the medical curriculum, it may be well to narrow it down to the essential issues. I would state them thus: (1) Is it desirable that medical students should be taught something of dental surgery? (2) What should be the scope and extent of the teaching? (3) How, when, and where is the instruction to be obtained?

To (1) I shall assume that the answer is in the affirmative.

(2) is not so easily answered. I think, however, that prosthetic dentistry and conservative dentistry must be excluded. For the rest, the requirements would seem to vary with the many fields of practice open to the medical practitioner.

A knowledge of dental hygiene and prophylaxis is an indispensable part of medical and surgical knowledge. The same is true of a knowledge of the consequences or possible sequelæ of dental disease, accident, or trauma, and of dental symptoms associated with such conditions as scurvy, diabetes, plumbism, congenital syphilis, cretinism, phosphorus poisoning, pregnancy—to name but a few.

The arrest of post-extractional hæmorrhage is important. The administration of suitable anæsthetics for dental operations should be taught to all general practitioners.

Coming to purely dental work, which, though specially the province of the dental surgeon, may in emergency be undertaken by the doctor, I would specify tooth extraction, the treatment of odontalgia from whatever cause arising, of periodontitis, alveolar abscess, and gingivitis.

All should be instructed in the differential diagnosis of true pyorrhœa alveolaris, marginal gingivitis due to the presence of tartar or dirt, and the conditions attendant upon the physiological process of the shedding of teeth. Some instruction should also be given on the evils arising from oral sepsis, more especially that associated with the presence of bridges, crowns, dead teeth, and roots.

The panel doctor and the country doctor must be able to extract and to give anæsthetics. The pure surgeon or physician and the practitioner in a large town need not concern themselves with extraction of teeth.

There remain the medical missionary and the colonial practitioner. These should be able to do something in the way of first aid dentally—that is, to put in a dressing, devitalise a pulp, and insert a plastic filling.

(3) If instruction in dental surgery is to be made compulsory for medical students, further facilities must be afforded: they certainly do not exist at present.

Neither at the dental hospitals nor the infirmaries is there room or sufficient clinical material for satisfactory practical teaching. The dispensaries may be counted out as of little value in this department of study.

Nevertheless, an effort should be made. The difficulties are great. There are very few competent teachers. There are no endowments for dental education, and the dentist who devotes any considerable part of his time to teaching suffers a pecuniary loss.

In Edinburgh it seems to me that there would have to be co-operation between the Infirmary and the Dental Hospital. Some extension of the dental department of the Infirmary would be needed. The course of instruction must be compulsory—an optional course would not survive. It should comprise at least fifty clinical lectures and demonstrations on dental surgery and medicine spread over the last two years of the medical course, together with attendance on practical instruction on extraction of teeth and administration of anæsthetics for dental operations.

The Scottish universities, with the exception of St. Andrews, which recently instituted examinations for a dental diploma, have not, up to the present, taken any interest in dental education or degrees for dentists. Should they determine to enter on this sphere of educational activity, the existence of a Chair of Dentistry and university lectureships would resolve most of the difficulties which at present beset the teaching of dental surgery and medicine in the medical curriculum.

LXV.—THE TEACHING OF DENTAL SURGERY TO MEDICAL STUDENTS.

By J. H. GIBBS, F.R.C.S.(Edin.).

ANYONE who has regularly attended these discussions upon the training of the medical student must have been struck by the demand that almost every teacher has made—that more time should be allotted to him for the adequate teaching of his subject—whilst really no one has complained that he has too much time. As matters stand at present, the student is undoubtedly overburdened, so that some boldness is required on the part of anyone who proposes that still another subject should be added to the curriculum. When one recognises that the medical student in all the Scottish universities graduates at present without having had any specific instruction in the two commonest diseases to which mankind is liable, one is surely justified in demanding that this state of affairs should be changed. Many universities have long ago recognised the importance of their medical students having some definite knowledge of the diseases of the mouth and teeth, and have required courses of instruction which, personally, I think are unnecessarily long.

The remedial treatment of dental disease is so specialised that it is by common consent relegated to the dental surgeon, and the general practitioner quite wisely sends any patient requiring this treatment to the specialist. To-day, however, is the day of preventive medicine, and the future will be so still more. Most dental surgeons are well aware that the great bulk of dental disease is quite easily prevented and that remedial measures are comparatively ineffectual, but they can do very little to help the patient, because the seeds of dental disease are sown long before they see him—in fact, during the first few years of life, when the child is so much under the care of the family doctor. Hence it is to the general medical practitioner that we must look for the proper upbringing of the infant and young child that these diseases may cease to exist. At the present time so ignorant is he of the real physiological functions of the mouth and its secretions, of the etiology and pathology of dental disease, and of the ease and success with which these diseases can be prevented by measures that are wholly beneficial to the general health of the child, that one has no hesitation in saying that the prevalence of dental caries and of pyorrhœa alveolaris to-day is almost entirely due to the vicious teaching and practice of the average medical man.

Again, every dentist who attempts to save the children of his patients from these diseases by instructing the parents how to bring them up in accordance with physiological principles, the soundness of which has been abundantly proved during the last twenty years by the success that has been attained in preventing not only dental but other diseases, is met at once by the active opposition of the far more powerful, but ignorant, general practitioner. It is more than time that this ignorance on the part of the average doctor of the physiological functions of the mouth and of the barest principles of dietetics should be remedied, and, provided it is remedied, I do not think it matters much whether the correct knowledge is imparted to the student in a special course of dental instruction or in his ordinary classes. Fortunately the physiologist does not spend much of his time, either in lectures or in the laboratory, over dietetics, the physiological functions of the mouth and saliva, the nature of mastication, and of the act of deglutition. It is extraordinary that, after all the work that has been done along these lines both in this country and abroad, physiologists should almost without exception still hold and teach views that have been discredited for many years. Now, inasmuch as the great bulk of dental disease is the outcome of this pernicious physiological teaching, the first thing to do seems to be to educate the physiologist or to protect the student so far as possible by letting him come under better influences later in his course.

If the medical student is to have a special dental course, as in the present circumstances I think he should, the instruction should be made as short as possible and carefully designed to meet the needs of everyday practice. As a result of my own experience as a teacher and practitioner, I think that the medical student should be taught correctly the physiological processes that occur in the oral cavity and the principles of dietetics, including the proper feeding of infants and young children. He should also be taught the etiology and gross pathology of the two commonest diseases—dental caries and pyorrhœa alveolaris — and the ease with which they may be prevented by physiological means, and the futility of artificial aids. Because dental diseases are so rarely a direct cause of death, the general practitioner is apt to look upon them as of no importance, and it should therefore be impressed upon the student that they cause more pain, ill-health, and inefficiency than any other disease, while indirectly they do entail a large mortality.

Even consulting physicians, teachers of students, habitually pour good food and medicine into patients who often benefit but little, because they are absorbing toxins from ulcerated areas in their mouths that may amount to several square inches. Were ulcers of a tenth the size to occur in the much-examined rectum or on the skin, they would be vigorously and promptly treated. Similarly, children are allowed, with the full knowledge of their doctor, to retain decomposing teeth, often with abscesses, simply because they may not be causing actual pain. The student must be impressed with the importance of his patients having clean mouths at all costs. To-day, even when this is realised, it is effected by extracting the teeth after they have become unnecessarily diseased and a menace to the health of the patient, but the student should be taught that the mouth and teeth must be kept clean, not by disfiguring mutilation, but by simple and rational preventive measures.

As regards remedial treatment, he should be taught that neuralgia is only a symptom and that the cause can nearly always be discovered and easily removed. He should know simple means of relieving toothache, and especially how to stop hæmorrhage from a socket after an extraction. He should, of course, be taught such a common operation as the extraction of teeth. The principles involved can be explained to a large class, and this should be supplemented by a demonstration and actual practice.

I think that the minimum instruction necessary could be given in a course of seven or eight meetings—it being taken for granted that the medical practitioner is not to act the part of the dentist, but through putting into practice his knowledge of general principles is to be an apostle of a much higher standard of personal hygiene and national health than obtains to-day.

LXVI.—THE TEACHING OF DISEASES OF THE EAR, NOSE, AND THROAT IN THE UNDERGRADUATE CURRICULUM.

By A. LOGAN TURNER, M.D.

The specialty entirely justifies its place in the curriculum of the undergraduate. It does so on two grounds—first, the progressive importance of the specialty; secondly, its value as a diagnostic factor in the recognition of many general diseases.

Let us bring evidence to support both of these points. In 1899 there was one Ear and Throat Department in the Royal Infirmary and the number of new patients seeking advice during that year was 1150. Fifteen years later—I have taken 1914, as the war may have affected hospital attendance in the immediate past—there are two departments, and in my own the number of patients attending for the first time during that year was 3363. If my colleague's patients be added, the total is considerably increased, probably approaching 5000. The number of adenoid and tonsil cases alone in 1914 exceeded the total patients visiting the department in 1899, being 1278 in number. It is one of the busiest departments in the Infirmary—a striking proof of its usefulness.

During these fifteen years the specialty has not only increased the number of its patients but it has greatly extended its boundaries. We have practically taken over from the general surgeon intracranial surgery in relation to septic infections from the ear and nose; we have come to the assistance of the ophthalmologist in the treatment of orbital conditions secondary to infections of the nasal accessory sinuses, and we are prepared to help him in his cases of chronic dacryocystitis. We have extended our territory to the diaphragm, and in our examinations of the œsophagus and lower air-passages we can assist the surgeon and the physician in the diagnosis of important conditions, while the treatment of foreign bodies in these regions has gradually passed into our hands. The more recent elaboration of the tests in connection with the eighth cranial nerve has called us to the help of the neurologist in determining the diagnosis of certain obscure intracranial conditions. We have thus made our annexations: we have not yet claimed our indemnities, but this we propose to do after the war. I shall refer to that presently.

The second argument in favour of its inclusion in the curriculum is based upon the value of the specialty in the recognition of many diseases. The ear, nose, and throat are to the body what the outposts are to the army in the field; they may furnish us with the first signals of danger and of the presence of the enemy—disease. Vertigo may herald the advance of arteriosclerosis and epistaxis may prove the first warning of renal mischief. The discharging ear should keep the practitioner alive to the possible source of the headache and vomiting due to a secondary brain abscess or meningitis, and to the origin of those rigors and varying temperatures accompanying a sinus thrombosis. The changes in the mucous membranes of the throat and in its lymphatic tissues may be the first evidence that the patient is the victim of syphilis, or they will furnish an explanation of some of those obscure toxic conditions which are often baffling. In hoarseness we may have a striking danger-signal, giving the first indication of the presence of deep-seated malignant disease, of pulmonary tubercle, of aneurysm, or of a central nervous disorder.

And this brings us naturally to the principle which should underlie the instruction of the undergraduate in this subject, viz. to acquaint him with the relations which the organs bear to general diseases. The teacher should approach his class mindful of the fact that his own training should have made him a surgeon and a physician, provided with a better knowledge than his colleagues of these special regions. One is almost inclined to say that while he is teaching he should forget that he is a specialist. No finicky details: no elaborate description of operations: no minute account of rare conditions. These must be reserved for the post-graduate course. This is the principle upon which I have taught undergraduates for fifteen years, and I believe it to be a sound one—teach them to recognise the appearances presented by the common ailments and point out to them the significance of the symptoms which I have enumerated. The danger which one sees throughout the whole of this discussion is the lack of a proper perspective—the risk being that each man attempts to teach too much of his subject. We teachers spend the best years of our lives in acquiring our own knowledge and we never attain perfection: how can we expect more than the simplest essentials from our pupils?

What are the means at our disposal for conducting such courses? Three terms, each of ten weeks, and each student, in his fourth or fifth year, must attend for one term. There are thirty meetings in a term, nine or ten for a more or less systematised account of the commoner conditions and their bearing on general medicine.

Twenty clinical meetings—the whole class is restricted to thirty or forty members. The clinical meetings are still further limited, preferably to ten or fifteen. The whole available staff takes part in the clinical teaching. This is an essential part of the arrangement—good for the staff and in the best interests of the student. The teaching staff is encouraged to do scientific and clinical research, because when teachers are thus engaged, they can then infuse a scientific spirit into their pupils, while it also improves their manner of teaching.

As many of the common ailments as possible are shown and the class handle the patients themselves.

Twenty clinical hours are not sufficient. We ought to have twice that number. In the medical schools of Canada and the United States the programme is more ambitious, and facilities are given in some of them for students attending at two periods in their curriculum. A short junior course for anatomy, methods of examination, and the recognition of what is normal in the ear, nose, and throat, and a later course, nearer the final term, where diseased conditions are investigated, would more nearly approach the ideal.

Now I come to the indemnities. I have said that there are two departments, but both are compelled to work in and share the same out-patient room, the same theatre, the same wards. This is not as it should be in a large and progressive specialty. I am consequently forced to teach on certain days, and could not teach on other days if I would, because my out-patient room is occupied by my colleague. Some arrangement must be come to between the University authorities and the Infirmary management to put the Ear and Throat Department on the same footing as the Eye Department, providing each surgeon with a distinct and separate department. The money must be forthcoming. Both on teaching and scientific grounds and in the best interests of the patients it is necessary, and though the improvement is unlikely in the immediate future I hope to work for it for the benefit of my successors. The reputation of a large medical school cannot rest upon its teaching advantages alone: it is the duty of every member of the staff to aspire to something more than a routine and efficient discharge of his obligations to his pupils, and to endeavour to do something to add to the sum of knowledge of his own particular branch. We are apt to criticise the waning success of our Alma Mater. Some of us, I am afraid, are too ready to blame the curriculum and are forgetful of the human factor. Does not some of the remedy lie in our own increased efforts?

LXVII.—THE INSTRUCTION OF THE UNDERGRADUATE IN DISEASES OF THE EAR, NOSE, AND THROAT.

By J. MALCOLM FARQUHARSON, M.B., F.R.C.P.

I HAVE had pleasure in acceding to the request of your secretary to speak briefly on this subject to-night, and shall make my remarks as succinct as possible. I shall accordingly enter into no great detail, but shall indicate the principles which appear to me to be most desirable, if not essential.

This subject has now become a compulsory one in the course of medicine, and it will at first probably be difficult for the department to cope with the number of students presenting themselves for instruction, and in all probability changes will have to be made to suit requirements and altered circumstances. It would appear, however, to be certain that the size of the class must be kept as small as possible, and this for various reasons. Comparatively few of the diseases affecting the ear, nose, and throat are recognisable without the aid of instruments, and accordingly it is impossible to demonstrate them to numbers at one time. At first diseases can be shown by the teacher to one student at a time, but the scope of this elementary instruction must, very soon, be widened, and the student taught the use of the instruments and to train his powers of observation to recognise the disease for himself. This, of course, occupies much time and is a handicap to the teacher in aural, nasal, or laryngeal work, and presents a difficulty to him which is not encountered by teachers of most other subjects. Happily for teaching purposes, the majority of the diseases which come under review at out-patient clinics are of a chronic nature, and can therefore be handled and demonstrated more or less freely, and to some extent this is a countervailing advantage to the teacher. It must not be forgotten that we are dealing with undergraduates who have necessarily a comparatively small clinical experience, in contradistinction to the post-graduate, who is in a position to apply principles in a way impossible to the former. It is necessary then that the undergraduate teaching should be confined to a limited field, in which, at any rate in the first instance, the commoner diseases are fully demonstrated, being those conditions in fact which he will most frequently encounter in general practice. Seeing that clinics must be limited in numbers, how can the students all be instructed adequately? There are at present two lecturers appointed by the university and the conditions at present permit of their adequate instruction by the lecturers, assisted by the assistant surgeon. If, in the future, the numbers applying for instruction increase, then the university may have to consider whether the assistant surgeons of the department ought not to be co-opted officially for assistance in carrying out the obligation of the university to the student. I can see in such an arrangement an important incentive to the junior members of the staff, and one which I believe they would appreciate.

Further, also, I think the student should have the advantage of clinical lectures, whereby the teacher is enabled to focus attention on essentials and arrange and systematise the instruction by him. In my experience the average student does not make much use of text-books, probably from want of time owing to the pressure of other work, and from difficulty in selecting what to read; and if he does, much time and energy is often dissipated upon the study of diseases of a comparatively unimportant or abstruse nature. In the lecture such points as the differential diagnosis, avoidance of pitfalls, and the details of treatment can be more fully elaborated than is possible by the use of text-books alone; besides, the personal oral teaching will, in my opinion, be conducive to better results, and in this view I am supported by the opinion of students, with whom I have frequently discussed this point. Again, as a further advantage it is possible to save some time weekly by teaching a larger number of students collectively, and it is an agreeable variety in the routine of teaching.

The clinic and the lecture should be supplemented by tutorials, wherein instruments can be demonstrated, operative proceedings referred to, and full instruction given in methods of examination. The employment of models, specimens, and occasionally of patients in tutorial work will, of course, materially assist the student in acquiring familiarity with diagnostic methods and therapeutic procedures.

Personally, in carrying out the teaching in the department, I have two clinics and two lectures weekly; in the latter I take the opportunity of discussing more fully any important case that has come before us in the clinic. In this way I am enabled to have about thirty-five meetings in the term, with what, I consider, satisfactory results.

With one point of importance I will conclude what I have to say on this matter, namely, that the teacher should take every opportunity of showing the bearing which aural, nasal, and laryngeal diseases have on general medicine and surgery. I would refer to asthma, aneurysm, thoracic neoplasms, epistaxis, etc. The importance of these interrelationships can hardly be over-emphasised, and the future practitioner should early be taught to take a broad view of such subjects and not to confine his diagnostic facts to the special region where symptoms appear.

These are the principles which seem to me to underlie the successful instruction of the undergraduate, and, given their acceptance, I am sure that it would not be difficult to work out the practical details.

DISCUSSION.

Dr. George Mackay emphasised the importance of teaching ophthalmology clinically, and supported the appeal that had been made for increased accommodation in the Infirmary for this purpose. As a Manager of the Infirmary he said that only the lack of funds prevented this being provided. He also urged the necessity for provision being made for higher teaching and for research, and for the wider employment of the junior members of the staff in teaching.

Dr. Sinclair.—From personal experience in teaching ophthalmoscopy to undergraduates and graduates, I can say that little or no advantage is gained from tutorial instruction in ophthalmoscopy, unless the use of the instrument be continued in the medical wards. The use of the ophthalmoscope should be insisted on in the medical wards, and reports and drawings of the optic discs, retinal vessels, etc., attached to the clinical records of medical cases taken by clinical clerks, whether there is anything wrong with the eye or not.

The difficulty in learning to use the ophthalmoscope (indirect and direct methods) is no doubt a considerable barrier to what I have suggested, and may be discouraging to the beginner in clinical medicine. If, however, the patient is examined with the pupils dilated, and the student has the encouragement and guidance of his teacher, this difficulty will be overcome.

The electric ophthalmoscope is much easier to use than the ordinary one and affords a very attractive picture of the fundus oculi. Each medical ward should possess an electric ophthalmoscope for the use and convenience of students in case-taking.

The teaching in the Eye Department will, as in other charges, be under the entire direction of, and in the main be carried out by, the ophthalmic surgeon in charge of the department. The assistant ophthalmic surgeon should, however, take some regular part in the teaching—such as may be allotted to him by the surgeon in charge. This is important in the teaching of practical ophthalmology, where clinical demonstration forms the most valuable and the largest part of the work.

It is also important that enthusiasm for, and facility in, teaching should be developed in the assistant surgeon, as he may at any time be called upon to undertake the whole work of the class, and, in the ordinary course, will have to do this when his turn comes. It is essential that he should have practice as a teacher in order that he may be able with the greatest efficiency to carry out the duties of a teacher of students when his time comes to do so.

Dr. J. S. Fraser said that one of the great difficulties in the teaching of the ear, nose, and throat is that the student must master the use of reflected light, and this he finds very difficult, particularly in laryngoscopy. It is impossible to teach students laryngoscopy in the time available.

In conducting tutorial classes he had found it necessary to devote a large part of the time to teaching the anatomy and physiology of the organs of special sense. This should be done in the departments of anatomy and physiology and so leave the surgical tutor free to devote his time and attention to clinical teaching.

Diseases of the ear and their complications are attended with such a mortality that it is essential for the undergraduate to be thoroughly instructed in this subject. If general practitioners realised the dangers of "running ears," and were taught to recognise the onset of serious complications, there would be a considerable saving of life.

In the teaching of the special subjects it is essential to deal with small classes, and this necessitates the employment of every member of the staff in teaching and the provision of better accommodation in the department.

Dr. Traquair had found it very difficult to teach the students ophthalmoscopy in tutorial classes. Even in a special class for post-graduates, extending over thirty hours, the results were only moderately satisfactory. Their main difficulty seemed to be to learn the management of light. The use of the ophthalmoscope should be practised more in the medical wards than it is, and if the electric ophthalmoscope were used the student would soon learn to see clearly everything that is to be seen in the fundus, and would appreciate the bearings of the eye changes on general medicine. The ophthalmoscope is really a physician's diagnostic instrument and should rank with the stethoscope and the sphygmograph.

Diseases of the eye should not be presented to the student as a "special subject" but as a part of clinical medicine and surgery. He was of opinion that an examination on the subject was a stimulus to the student to master the subject.

Mr. Wilkie said that at the end of the war an enormous amount of money will be spent in keeping up hospitals for assisting those disabled in the war. That expenditure will fall on the Government. If medical men are to be adequately trained to staff these hospitals, the Government should provide money to support the hospitals which are essential for the teaching of the medical men ; emphasis should therefore be laid on the financial aspect of the question.

Dr. Clarkson thought that all a general practitioner requires to know of dental surgery could be taught in a course of seven or eight meetings. He was of opinion that there should be no difficulty in teaching the student enough of the use of the ophthalmoscope and laryngoscope to enable him to recognise whether the condition present was one he could treat himself or whether it should be sent to a specialist. The use of these instruments should be commenced early in the student's training, and should be encouraged in every way in the wards.

Dr. Norman Walker thought that the rising generation of teachers was extraordinarily pessimistic about the outlook of things. He remembered getting instruction in the ophthalmoscope and laryngoscope at the physiology class, and again from Sir Robert Philip when he was assistant to Sir Thomas Grainger Stewart, and as a student had in the medical ward quite common opportunities of using both the laryngoscope and the ophthalmoscope.

Dr. Rainy said that when he was clinical tutor part of his work was to teach the laryngoscope and ophthalmoscope, and practically every student drew one or two funduses and one or two vocal cords before he was allowed to leave the class-room. When he had charge of the women students they practically all learned the use of the ophthalmoscope in the medical wards, and about 50 per cent. of them bought one for themselves before they left the ward, which showed they appreciated the instrument and were likely to use it. He thought it desirable to have an examination.

PROFESSOR LORRAIN SMITH.—It is important for us as a committee to hear the point thoroughly discussed as to how far the students should be examined in ophthalmology. The Dean is quite in favour of making the class certificate as much as possible take the place of the formal examination. A great many of our discussions have introduced the idea that the term work should as far as possible relieve the student of the burden of his professional examinations.

DR. LOGAN TURNER.—I am in favour of the tendency to build up the examination during the curriculum and not at certain periods. One of the first things I tell my class at the beginning of the session is that there will be a class examination and that all of them who obtain a certain percentage will qualify for the Final. I am against the suggestion that there should be a Special Final Examination in ear, nose, throat, and eye subjects.

DR. J. V. PATERSON.—I hold the same view as Dr. Logan Turner. The examination could quite well be connected with the class work, and the men should not have to sit a separate examination in the Final. It should be made clear to the students, however, that the examination they have to get through at the end of the course of diseases of the eye or of the ear, nose, and throat is the qualifying examination for the Final.

DR. NORMAN WALKER.—I agree with Dr. Logan Turner in this matter. I have no difficulty about taking the *onus* of refusing a certificate. At the first lecture of every course I explain to the students that the responsibility is laid upon me of seeing that they shall not go out of this university without such a knowledge of dermatology as shall not do discredit to the university. If they do not succeed after going up twice, I make them take the class out again.

DR. SIM.—I would hesitate to stop a man from passing his Final solely on the ground of his not being proficient at eyes. I think ophthalmology ought to be correlated with the other subjects.

DR. GIBBS suggested that a plan might be adopted by which a certain percentage in the class examinations entitled the student to a qualifying certificate, while a higher percentage exempted him from a special examination in his Final.

DR. PATERSON said in reply.—I am in agreement with those who say that ophthalmoscopy, from the point of view of general medicine, is only properly studied in the medical ward. The students would not require much stimulus if ophthalmoscopes were provided, and there is no difficulty whatever in dilating the pupil and no danger attached to it with reasonable care.

I think in the eye ward we are inadequately equipped. This lack of equipment in Britain tells far more on the training of the teachers than on the training of the students. The British ophthalmologist has less opportunity of learning the higher branches of his profession than the ophthalmologist of any of the highly civilised nations of the world. The assistant in my day was overloaded with routine work at the Infirmary. The senior assistant should not spend his whole time, and the senior surgeon should not spend hours after the students have gone, in testing the refractions of school children. That is the reason why there is not the time for research. The training in physics and physical optics, for example, is inadequate. The physiology of the eye has all to be learned from the book. From the scientific point of view we are behind many of our continental friends and enemies, because we have not the equipment and the time for the training and because our energies are completely taken up by the routine work of the hospitals.

Dr. Guy said in reply.—The idea of giving fifty lectures and demonstrations on dental surgery has been rather scoffed at, but I think I am perfectly justified in taking that as the absolute minimum. I specified, for example, the administration of anæsthetics for dental operations. I have no hesitation in making the specific statement that no man knows anything whatever—as I should understand knowledge of that department—about the administration of anæsthetics more particularly for dental operations until he has had at least fifty opportunities of administering the various anæsthetics under skilful supervision. I said these meetings should be spread over the last two years of the course. In that regard, if I may pass from the particular to the general, it strikes me that what is required in the teaching of the eye specialities which have been dealt with is co-ordination between surgeons, physicians, and specialists. The most important part of the medical training, in my view, so far as the man's life and practice are concerned, is in his clinical training, which of course should only come after he has had a sufficient training in the ancillary sciences and in the principles of medicine and of surgery. Why does not the clinical teacher invite the co-operation of the specialist? We all know that there are many medical and surgical conditions which remain obscure to the ordinary physician or the ordinary surgeon because he is not a skilled specialist. I think that surgeons and physicians might select such cases for cliniques, and even for clinical lectures, and might on these occasions invite the co-operation of the specialists. In that way the medical student would have borne in upon him how important the bearing of a study of the various specialities was upon the general practice of his profession.

The other point which has struck me in this discussion is the point which the chairman, I think, raised as to how far class examinations might be allowed to supersede Final Professional Examinations. That is perhaps the most important point which has emerged in this discussion to-night, at any rate to my mind. On the part of some there appears to be a hesitation to assume the responsibility for saying that this man is fit and competent or that he is unfit and incompetent. Of course there are other aspects of that question. There is the man who is perhaps afraid that if he exacts too high a standard from his students they will forsake him. All these difficulties might be overcome, I think, if the class examinations were not confined simply to the writing of a paper at the end of the course, but were continuous throughout the course, *i.e.* at the latter part of every meeting the lecturer might ask the students to perform some of the procedures which had already been demonstrated to them, might note the value of their answers and the skill which they displayed in manipulative processes. Thus at the end of the course the teacher would be enabled to say quite definitely, "This man has profited by my instruction, and I therefore have no hesitation in giving him a certificate to say that he is in this department a fit and competent person to enter upon practice." How could such an impartial decision be arrived at? There might be difficulties in the way, but I think it might be possible, not always of course, but from time to time, to have an assessor present, who might be allowed to put questions and to assist in arriving at an assessment of the value of the work of a student. Were that done, I feel quite certain that it would be a step in advance, that it would be of great assistance to the teacher, and that it would be a very great stimulus to the student.

LXVIII.—THE PLACE OF RADIOLOGY IN THE MEDICAL CURRICULUM AND THE NEED FOR CO-ORDINATION IN TEACHING.

By ROBERT KNOX, M.D.

In by-gone days, when the fame of the Edinburgh school was at its height, the value of encouraging initiative and enterprise on the part of the leaders in the profession was amply demonstrated by the valuable work carried out by a number of men too numerous to mention individually, but whose names will readily occur to you since they are monumental ones in the history of the development of medicine and honoured in the annals of your school.

Mr. Alexander Miles, in his admirable book *The Edinburgh School of Surgery before Lister*, gives an interesting description of the process of evolution at work which led to the establishment of the Edinburgh School of Surgery, and clearly shows the value of encouraging originality and foresight and of giving a free hand to those who show by their actions that they are capable of doing valuable pioneer research work.

It is to be hoped that in the near future this valuable book will be followed by others dealing with the development of the Edinburgh School of Anatomy, of Medicine, and other useful branches of the common tree. There can be no doubt that the material is at hand for the production of a series of valuable books recording the vicarious fortunes of these many branches.

At this period of its history the Edinburgh school attracted students and practitioners from all parts of the world, and it was the privilege of Edinburgh to send out all over the world trained men who by their subsequent work still further enhanced the prestige of the school. These were the halcyon days of Edinburgh as a teaching centre. Some twenty years ago I was interested in the subject of pathology, an interest I was fortunately imbued with when a student at Professor Greenfield's lecture-room, and at that time, if my memory is correct, two-thirds of the leading chairs and lectureships at teaching centres were occupied by men who had been students at Edinburgh University. Similarly in anatomy, Edinburgh was turning out men regularly who were qualified to take high places in the teaching of the subject.

I could go on for a long time citing instances where the foresight of your governing bodies has led to the development of new discoveries and ideas, but no useful object would be served, more particularly as we are concerned with the present and the future rather than with the past. A contemplation of the history of the school is, however, useful when we come to deal with the steps which should be taken to ensure that Edinburgh may occupy in the future that position which her great past indicates that she should occupy.

It is with the future that I ask you to deal, and particularly with the future of the important subject of radiology.

The development of the uses of electricity in medicine at Edinburgh has been somewhat unequal.

The late Dr. Milne Murray, a pioneer worker in medical electricity, introduced electrical methods and apparatus which at that time gave Edinburgh an opportunity of placing the subject on a very high level. That opportunity was allowed to slip away. I remember on one occasion at a clinical lecture on medicine a simple faradic battery was required for the demonstration of a nerve or muscle reaction. A professor, his chief assistant, fifty students, and several sisters and nurses of the ward were present, the battery was produced, the patient's skin was duly moistened with salt solution, the switch was "turned on"; nothing happened. Believe me, gentlemen, not a single individual in the room knew what was wrong; the demonstration was a complete failure, and that occurred in a hospital at which Dr. Milne Murray was a teacher—surely a clear indication for the need of systematic teaching, if ever one could be cited.

The discovery of the X-rays by Professor Röntgen and the speedy adoption of their use all over the world gave you another opportunity for pioneer work of which a few men promptly availed themselves. Very soon after the discovery Dr. Dawson Turner devoted himself to a study of the actions of the rays and their uses in medicine. I well remember in 1896 attending a popular lecture at the Queen's Hall when Dr. Dawson Turner gave to a very large audience a demonstration of the X-rays in action; an exposure was made and a plate taken. I remember how impressed I was at the time, and how I left the hall convinced of the immense future before the X-rays, and I confess I felt certain that Edinburgh would hold in the field of radiology a position second to none, basing my conviction on a knowledge of the past and the enterprise exhibited by your leaders in fostering new discoveries and developing them to the utmost.

That conviction has not materialised. Edinburgh does not hold a position in the front rank, and you at the present time are a long way behind other centres in this country and the world generally.

Why has this been allowed to happen? Your governing body has not exhibited true foresight guided by experienced minds, and has failed to take action at the right moment in order to ensure the development of a most important branch of medicine.

It is not the fault of the men you have had in charge of your departments. Any one of them, if he had been supported by the profession and had been given material aid by the management of the Infirmary and the Senate of the University, could have worked up the subject and developed a centre of very great importance.

Dr. Dawson Turner is known widely as a pioneer worker in X-rays and radium. The late Dr. Price was recognised by leading workers as a prominent radiologist, and the present holders of the position at the Royal Infirmary, Dr. Hope Fowler and Mr. Archibald M'Kendrick, are known to be workers of sterling value.

There has been a failure on the part of the physicians and surgeons to recognise the importance of the subject and its great future sufficiently early, and a lack of co-operation between radiologists and other experts in other branches of practical medicine. Is it surprising under these circumstances that the governing bodies should fail to grasp the opportunity and give the support and encouragement which the workers in the subject had a right to expect?

This want of foresight and lack of sympathy is not confined to Edinburgh only. It is and has been prevalent all over, but fortunately the conditions are changing and the radiologist is, however feebly, groping for his place in the sun; and let me assure you, gentlemen, if I read the signs correctly, he means to get it, and that, I trust, very soon.

The chief duty of an advocate of any particular line of development must be to produce proof of the value of the subject and to show that its proper development will lead to the production of results of undoubted value.

It seems, therefore, that in order to convince you of the importance of my subject I must begin by showing that it is worthy of the support I claim for it.

Taking the subject as a whole, radiology in its applications to medicine embraces the use of radiations for diagnostic work and in therapeutics. These two are, to a large extent, distinct, though, as I shall show, they cannot be completely separated. A therapeutic application of X-rays or radium given primarily for therapeutic purposes may become diagnostic. I refer particularly to the action upon enlarged glands where, as a result of experience in therapy, it may be possible to indicate the nature of the lesion by the degree and the rapidity of the response to the radiations. But, speaking generally, it may be stated that the diagnostic side can be separated from the therapeutic. Both are of the greatest importance in the future development of medicine and surgery. I shall deal with them separately.

What I want chiefly to point out is the complete interdependence of radiology with other branches of medicine and science generally, and the absolute necessity for a close co-operation between men specialising in this and other branches; the pathologist, the anatomist, the physician and the surgeon can all learn something from the application of radiography to his special subject.

The physicist can help us greatly in our appreciation of the scientific side of the subject, while he, on his side, may gain immensely from collaboration with medical men in the joint consideration of biological processes which may be dependent for their activities upon purely physical effects.

The anatomist can study the internal structure of bone, the formation of joints, and the relations of the bones entering into them in a way which was not possible before. Stereoscopic radiograms of bones and joints when carefully studied will give a very clear conception of the real anatomy of the structure.

In a study of the epiphyses of the bones, radiography will lead to the accumulation of evidence which may in the future revolutionise the teaching of the present day. Every anatomical school should possess an efficient X-ray installation for the carrying out of research work, and research must not be confined to the cadaver. Radiograms of living subjects must contribute largely to the accumulation of accurate data.

The pathologist will find new fields for investigation, or rather he will find in X-rays a means of interpretation of the internal structure of tissues. The value of a sound knowledge of pathological processes will be appreciated by the physician when he attempts to interpret the confusing shadows which go to make up a good radiogram.

I could show you a large number of radiograms, all more or less perplexing to the casual observer, which can be readily interpreted when the combined knowledge of the pathologist, the physician, and the radiologist are brought to bear upon them and the facts ascertained by each are given full weight in their deliberations.

There is practically no field of medical and surgical investigation in which the use of radiography is not of great value. A due sense of proportion is, however, necessary if the radiologist is not to become over-enthusiastic in his claims for his subject. Lack of balance and knowledge have before now been the causes of failure on his part to render true service to his colleagues. A complete sympathy and co-operation is essential if full value is expected from the new aid to diagnosis.

The surgeon has reaped the full benefit of radiography from its commencement because early in the development it was applied to the diagnosis of gross lesions of the bones. As time passed and refinements in technique followed it was possible to go beyond this, and the use of the rays was directed to the elucidation of obscure conditions of bones and joints, including the inflammatory diseases, tumours of bone, and specific infective conditions like tubercle and syphilis.

Later, the deeper-seated diseases in the interior of the body came under survey, until at the present time it is possible to investigate practically any region of the human frame. The investigation of the skull and brain, the thoracic viscera and the lesions of the gastro-intestinal tract, the urinary tract and the pelvic organs has led to the establishment of highly specialised techniques for these regions and now threatens to create in our midst a number of new specialists whose activities may be confined to the area limited by their knowledge of the region they specialise in. Perhaps a later development may lead to the men practising in special branches of medicine becoming experts in radiography so far as their special subjects are concerned. There is even at the present time a tendency in this direction. This will end in disaster, so far as the value of radiography in diagnosis is concerned, if steps are not taken to ensure that every man gets a sufficient amount of knowledge to enable him to understand the work he carries out. The best results can only be obtained by co-ordinated teaching in radiology and the branches of medicine associated with it.

If such an end is to be attained, the subject must come into the curriculum of the course of study and all students must be taught the elements of this important work. We must either educate a large number of expert radiologists or teach all medical students in such a way that later they may be able to apply their knowledge. It would be an advantage to do both.

The former plan will naturally give greater value, since an expert must know more than one who has only a casual knowledge of the subject.

What has been said of radiography applies with more force to radiotherapy. In this new development we possess agents whose activities are great for good or harm. It is more essential than in radiography that the control of treatment should remain in the hands of medical men.

The practical application of radiology is not entirely confined to medicine and its allied subjects: already the rays are being used in other fields of research and their use is being extended. Thus in the radiography of metals extensive use is being made of their power to disclose flaws and faults in shells, while aeroplane parts can also be scrutinised for the detection of faults. In commerce and engineering the field for radiography is very large, and in time every engineering department will be fitted up with an elaborate X-ray installation, while the departments in teaching schools devoted to these subjects will also require to install X-ray outfits.

The field of usefulness is rapidly extending and there is room for a large number of men to engage in research work—physical, pathological, clinical, and biological. Many interesting problems lie invitingly before us which for their elucidation require the very best skill and intelligence at the command of the profession.

In this branch of our work we have to call in specialists in physics, electricity, chemistry, and electro-techniques. Already we have profited immensely from the pioneer work of prominent physicists in this country and throughout the world. We require a closer collaboration between the physicist and the medical man.

In practical medicine it is only necessary to refer to the great advances which have been made in the treatment of fibroid and other tumours of the uterus by X-rays, the use of radium for cancer and particularly cancer of the uterus, the treatment of lymphadenoma and sarcoma by X-rays and radium to indicate the future developments in therapeutics. The further investigation of these agents and their action upon the tissues calls for a large number of research workers.

The war has been responsible for a great development of radiography in its application to the investigation of diseases and injuries of bones and internal organs, and particularly in the localisation and removal of foreign bodies.

The surgeon has found that he cannot get through his work without X-rays, and in most instances the services of the radiologist are thoroughly appreciated. A tendency exists, however, in the minds of a number of our leading surgeons to disparage the value of the radiologist even to the extent of stating that any individual can be quickly trained to do the necessary technical work. He is even quoted as giving better value than a trained radiologist. That view might be allowed to pass unchallenged if it were not for the harm it is likely to do to the subject and to those who practise it.

The analogous condition in surgery is that of the bone-setter, who in many instances is better qualified to deal with an obscure case than the average surgeon. Yet what a state of indignation is excited in surgical circles when a bone-setter ventures to deal with cases which are regarded as the rightful heritage of the surgeon.

Only trained medical men should deal with diagnostic points in radiography—only surgeons should deal with injuries or diseases of bones and joints. The true position of the layman is quite auxiliary to that of the radiologist and surgeon.

If the surgeon availed himself more frequently of the services of a trained radiologist and the two considered their cases from all aspects, surgery would have a very small percentage of failures.

The place of the layman in any scheme for the advancement of radiology is of some importance. It might be well at the outset to state that the day when a layman could be placed in charge of an X-ray department at a hospital or private clinic is gone. The responsibility, which is a great one, should only be in the hands of a qualified medical man. Lay assistance is necessary and the layman must occupy a position in any scheme for the future. Assistants must be trained in the electrical side of the work and in the technique of radiography. The more thorough the training can be made the more efficient will be the work turned out in a department. Steps are being taken to ensure the efficient training of lay assistants, and it is hoped that an examination of proficiency, followed by the granting of a certificate, will soon be an established procedure. One of the conditions of the granting of a certificate will be that the holder must only work under the direct control of an experienced radiologist. It is hoped that in this way the layman will have an acknowledged place in our departments and that the status will be thereby raised. The next step will be to ensure that adequate remuneration for the work done is forthcoming.

The collaboration on an equal footing with the medical men of physicists, consulting engineers, and others whose work is essential will also be cordially sought after. In subjects such as radiography and radio-therapeutics there can be no hard-and-fast line drawn between the medical and the non-medical.

The endeavour of those of us who realise the growing importance of our speciality has been to initiate steps which, when materialised, will raise the status of the subjects and of the men practising in them. How can this best be done? The answer is obvious: it can only be done by recognising that it is necessary to teach adequately the subjects at the principal teaching centres throughout the country.

The subjects must be recognised as worthy of a place in the curriculum of study which students require to take before graduation. A full recognition of this kind would at once alter the whole position. It would follow that a chair of radiology and electro-therapeutics would be established at the university, and in my opinion no half-measures should be contemplated. The importance of the subject is sufficiently great to warrant us in approaching the university authorities in the matter.

Already an association of radiology and physiotherapy has been initiated. The chief objects of the new association will be to raise the status of the subjects and to provide for their adequate teaching. Cambridge University has been approached with a view to the establishment of a diploma in radiology and electrology, and there is every prospect that the diploma will materialise.

Teaching will be arranged for at Cambridge and London. It will be, to begin with, post-graduate, but there is no reason why another university should not take up the ante-graduate teaching and later establish a degree in the subjects. Here lies a good opening for Edinburgh to take the initiative.

The London scheme provides for post-graduate teaching at a number of the larger hospitals and steps are in progress for the co-operation of provincial schools. Edinburgh would form an excellent centre for the northern part of the kingdom.

In addition, when funds allow, it is proposed to have a large central institute in London at which the administrative work would be carried out, a museum established, a library, and demonstration rooms set up.

In a complete scheme for the adequate teaching of radiology and electro-therapeutics it is essential that the teaching should commence as early as possible in the career of the student. Physics is, I believe, a subject now included in the curriculum of study. The teaching of this important subject should be on lines which are likely to be useful in the after-career of the student. Thus it may be advantageous to indicate briefly the lines upon which the important subject might be taught. These briefly include the laws of electrostatics, attraction and repulsion, frictional electricity, static machines, electrostatic induction, influence machines, distribution of electrical currents in circuits, Ohm's law, generation of heat by electricity, Joule's law, production, measurement, and detection of electric currents, primary and secondary cells, the transmission of electricity through solids, liquids, gases, and animal tissues.

Electro-Magnetic Induction: the production of induced currents, relations existing between primary and secondary circuits. The induction coil, its construction, method of action, and the importance of the primary and secondary currents, low and high tension electrical currents.

Radiation: heat, visible rays, ultra-violet rays. Sources and methods of production.

X-rays: their production, their place in the spectrum. Relation between wave length and penetrating power. Laws relating to the absorption of X-rays by various substances, for example, metal, bone, tissues, fluids.

Secondary X-rays: their production and measurement. Scattering of X-rays. Conditions under which they may be regularly reflected.

Radium: properties of the different rays emitted by radium and other radio-active bodies. The laws according to which such rays are absorbed by different substances. Secondary rays excited by alpha, beta, and gamma rays.

Electro-technics: direct and alternating currents, their mode of production and distribution to X-ray departments, methods of utilisation of electric power—conversion of direct into alternating current, rectification of alternating current. Motors, dynamos, high tension currents, transformers, and many other practical points in connection with these subjects.

It would be possible in the physics course to include all of the above in a manner profitable to the medical student. He would then be in a position to appreciate the subject when he came into closer touch with it in his more advanced course, particularly in the practical applications of radiology to diagnosis in medicine and surgery and in radio-therapeutics.

The practical application would be taught in the X-ray department in the second or third year when he takes the course in surgery. Every student should spend six months in the department as a clinical clerk. It would be the duty of the radiologist in charge to arrange for a course of instruction which would be based on the following lines:—

Description of apparatus, arrangement of an X-ray and electrical department, with practical demonstration of technique. Normal radiography, localisation of foreign bodies, urinary radiology, pulmonary, gastro-intestinal, dental radiography, radiography of dislocations and fractures, of disease of bones and joints, and radiography of children.

Radiotherapy—X-rays: treatment of superficial diseases; deep-seated therapy.

Radium: treatment of superficial diseases; deep-seated diseases.

Organisation of X-ray and electro-therapeutic departments.

System of booking cases, filing, etc.

Photography: practical demonstration and lectures.

Electrology: systematic lectures and practical teaching in electro-diagnosis and electrotherapy.

By the end of the fifth year the student of the future will have learned a great deal more than the average specialist of the present day, and will be in a better position to appreciate the value of the subjects than the general practitioner of the present.

Advanced classes in physics, electricity, and radiology should be available for the use of the men who after graduation wish to proceed to the examination for a diploma or a degree at a university. It should be on the same footing as the B.Sc. or the D.Ph., and should be open only to graduates of at least one year's standing.

Research in these subjects should be encouraged by all means possible. Scholarships should be established. Resident posts at the hospitals and travelling scholarships would be an additional attraction to men desirous of specialising in them.

Research work could be as comprehensive as that in other subjects—in physics, electro-technics, pathology, biology, and experimental work in connection with the use of radiation in health and disease.

The field is large and will be fruitful of results if the work is gone into thoroughly. There are many problems in connection with radio-therapy which might well engage the energies of the very best men we possess. The subject is full of interest, and important discoveries await the ardent investigator.

The short past of radio-activity is full of brilliant research work and important epoch-marking discoveries. In the limitless future discoveries cannot be less striking.

The subject so far has been chiefly dealt with from the point of view of teaching the undergraduate, but I should like to see Edinburgh go far beyond that and venture at once into the establishment of a large post-graduate centre for the instruction of the numerous men who after the war will wish to devote a year or more to study. We in this country must be prepared for the end of the war, and one of the best ways in which our profession can meet future competition from our present enemies will be to organise for graduate and for post-graduate research work in radiology and physiotherapy.

The establishment of a chair in radiology and electrology at the university would be an important step in that direction.

A properly equipped institute would be required to deal thoroughly with the subjects. In this building it would be necessary to have a fully equipped X-ray and radio-therapeutic department, a museum, a library, lecture rooms and demonstration rooms.

The equipment of such an institute would be a matter for careful consideration. It would vary with the needs of the institute and the possibility of linking it up with existing departments at the university and the Royal Infirmary, collaboration with which would be both possible and valuable.

It might be necessary to fit up special laboratories for radium and X-ray research, but that could easily be arranged.

The radium equipment would be a heavy item since two or three grammes of radium might be required. Radium is now selling at £12 per milligramme. Three grammes would cost about £36,000. Apparatus might run into £2000, and a properly fitted up building would be necessary. In all about £50,000 would place you on a footing of equality with other large centres.

The existing radiographic and electro-therapeutic department would require to be brought thoroughly up to date. A considerable sum would be required—£6000 to £10,000 would suffice for all practical purposes. A total sum of about £100,000 would provide for ante-graduate teaching, post-graduate teaching, the equipment of a radium institute with the necessary supply of radium, and the endowment of a chair in the subject.

The business men who look so well after the financial side of your work might naturally ask: Where is the profit to come from? Well, the immediate result would be an increase of prestige. This would in time attract a large number of post-graduate workers who would expect to pay for the advantages they would get from a course of study.

Then your fame would be spread abroad and large numbers of patients would come for treatment.

The advantages of foresightedness combined with shrewd business capacity may be instanced in the famous Mayo Clinic of Rochester, U.S.A., which may be quoted as a thoroughly good business concern and one which is, from the scientific point of view, equally sound.

The Radium Institute of London, instituted a few years ago, is another instance of business enterprise. It has had to enlarge its premises and is daily doing more work, and that with the distinct limitations imposed by the conditions under which the work is conducted.

In Edinburgh you could establish a centre which could be unequalled, for you possess advantages which would all count in your favour. You have all the academic distinction of a famous university and school. All the scientific facilities lie at your hand. In physics you have a distinguished professor whose fame is world-wide. Your surgical fame is great, and in medicine and its allied specialities you are pre-eminent. It only requires a centre stone to complete the arch. That centre stone is radiology. Be bold; grasp the future in both hands. Establish a chair and a post-graduate centre, and equip a radium institute, and you will soon have a world-famous centre to which practitioners and patients will come in ever-increasing numbers.

It does not require prophetic vision to enable one to predict the great success which is certain to reward the workers in a school willing to deal with the subject boldly and thoroughly at the proper time. Initiative and enterprise must go hand in hand. There is no better time than the present, when the movement has been initiated elsewhere and active collaboration is earnestly invited. In this country it should be possible to establish centres for the teaching of students and post-graduates in radiology intimately linked up with those in medicine and surgery, and generally capable of holding their own in competition with those of other countries. Whatever centres are established, Edinburgh, with her unexcelled facilities and advantages, must occupy a leading place. She has occupied a proud position in the past and will undoubtedly do so in the future. It is my earnest wish to see in the near future my old school take a place in the developments of radiology worthy of its great past and establish a guaranteed future in the new field of practical medicine.

DISCUSSION.

MR. ARCHIBALD M'KENDRICK.—Dr. Knox has dealt rather with the establishment of a school than with the method of teaching medical students. Although I quite agree that a school such as Dr. Knox suggests might be established in Edinburgh, I think we would have some difficulty in coming to an agreement as to what course of lectures should be given in the medical curriculum on the subject of X-rays. There is no department in the Infirmary which does not send cases to the X-ray department: the negatives then go to the wards, where the students are instructed on them. Thus we have a scattered teaching of X-rays. One would like to see in addition a more centralised teaching. I should leave the teaching of radiology in such a position that it would be an introduction of the medical practitioner to X-ray work, rather than to teach him all the minutiæ of the subject.

Dr. Hope Fowler said that a place should be found in the curriculum for the teaching of radiology on a better footing than at present.

Dr. Spence.—Dr. Knox's paper takes a broad outlook on radiology, in which he is a past master. He has referred to lay radiographers: I hope we shall never allow the laity to control the purely medical aspect of the subject, and that electrical treatment will never be taken out of the hands of medical men. It would be just as unreasonable to do that as it would be to hand over joints to the bone-setter. At the Sick Children's Hospital next winter there will be a recognised clinique for the teaching of radiography to fourth- and fifth-year students.

Professor Robinson.—While I appreciate Dr. Knox's ideal, the problem before us is how to utilise five years for teaching. To carry out Dr. Knox's ideal and to keep to the five years' curriculum does not seem possible. As the anatomist has been referred to so often, I venture to say that everyone who has spoken seems to forget that the anatomist has to teach in one and a half years *all* the terminology, and there are about five thousand terms for the ordinary descriptive purposes of the medical man. To demonstrate to the students the movements of joints, we can only show them radiographs of joints in different positions.

Mr. Struthers.—I am interested in knowing whether elementary radiography really ought to be and must be in the hands of a medical man. We are hampered at present in the use of radiography because our facilities are so limited. I look forward to the time when a radiographic apparatus will be part of the equipment of every department in the hospital, and, instead of having to send the patient to a central department, we shall have our own X-ray apparatus, just as we have our own microscope and stethoscope. Is it not possible to train a number of skilled mechanics, who would work our apparatus for us, and let us use it freely every day and all day? I would have radiography taught as a part of ordinary surgical treatment instead of being too much centralised.

Dr. Rainy.—I would draw a clear line between what Dr. Knox has said as to post-graduate teaching and what he has said as to the possibilities of undergraduate teaching. In post-graduate teaching there is no question, if it is to be done at all, that it must be done in a thorough and efficient way. Men wishing as post-graduates to get some knowledge of X-rays must be expected to devote the considerable period of time to the subject that is necessary before one's diagnosis is worth anything. On the other hand, taking the practical point of the undergraduate, the question does arise: What sort of condition is he in when we get him to train? I take it that Dr. Knox would expect that he must have a certain knowledge of physics before he is taught the technique of X-rays. The student who enters for the course of physics is at present equipped with the following amount of mathematics:—Arithmetic, up to proportion; algebra, up to simple equations; and geometry, up to the third book of Euclid. He then has three months to build up on this an adequate acquaintance with physics. I would attempt that if electricity were the only branch to be taught. If you remember that there must be taught dynamics, physical optics, and the theory of heat and sound, three months is inadequate. Then, too, how many of our students are likely to carry out the practical technique of X-ray work later, either on the diagnostic or the therapeutic side. As long as the apparatus is such as it is at present, it is not a business concern for the general practitioner to do more than accept the findings of a specialist. And therefore I think that the undergraduate's training in technique should be a minimum. We constantly meet with the incapacity of the student to interpret simple radiographs or to understand that he is dealing with shadows and not with solid objects. We *must* teach him this. We can also in our ordinary ward work constantly use radiographs. We should have apparatus for the satisfactory demonstration of radiograms to our cliniques. But I doubt very much if there is time to do more, either in the central department or by the specialist who wishes to work by himself, than to teach the undergraduate the interpretation of the more important radiograms and the errors he must avoid in sending cases to the X-ray specialist. It is important that the student should have some knowledge of the end-products of X-ray work and their interpretation, and I think it is well that he should be taught the sort of things that with our present knowledge are worth asking the radiographers to tackle.

Dr. Chalmers Watson.—I agree as to the necessity of differentiating between post-graduate and undergraduate teaching. Dr. Knox has discussed the reforms of the medical school from the larger outlook, not dealing particularly with the requirements of the undergraduate. I should like to associate myself with what he has said as to the value of radiology in practical medicine and the necessity of embarking on some such scheme as he suggests. I have seen Dr. Knox in his department at Queen's College, with its admirable facilities for teaching and technique. If his enthusiasm can supply us with the courage, vision, and initiative which we lack, he will have done us a signal service. We can and ought to do more for the teaching of the undergraduate. The university has obligations in this matter which it ought to recognise.

Radiology must remain to a great extent in the hands of medical experts. The more I see of radiology the more I am dependent on the skilled opinion of the medical expert, who is doing it every day and all day.

Dr. J. S. Fraser.—We have in the Ear and Throat Department an X-ray apparatus which Dr. Logan Turner fitted up at his own expense, which we have found of the greatest value. The late Major Porter studied X-rays for some time abroad, and on his return he gave us excellent X-ray pictures of the nose and accessory sinuses, and of the mastoid. Instead of having to send a patient to the X-ray department, we had both him and the apparatus on the spot, and the radiograph could be taken at any time. I think there are certain advantages in this separation from the central department. If we had an efficient X-ray installation attached to the special departments we would possibly be able to learn more from it than from perhaps better skiagrams taken by specialists out of our ken.

If this arrangement works better in regard to our own knowledge of clinically studied cases, that in itself would have a certain relation to the teaching of the students. If we had a case for diagnosis, and we could *show* the student the method of taking the X-ray plate on the premises, it would be of value in the teaching.

Dr. Gardiner.—The question of teaching radiology in relation to dermatology is very important, as radio-therapeutics occupy a large part in the treatment of skin diseases. Radiotherapy as regards teaching is of extreme value to the students, and part of our regular routine is to teach them in our own X-ray department.

Dr. Traquair suggested that such things as the movements of joints might be illustrated to a large class by means of the cinematograph. It is not necessary to teach students how to take X-ray photographs.

Dr. Knox said in reply.—I consider that no lay person should ever be put in charge of an X-ray department under any circumstances whatever. It is quite a different matter when you come to deal with the lay operator who works under direct medical supervision. That is unavoidable. We cannot possibly train sufficient medical radiologists to do all the work individually. At my hospitals I train nurses, and I find I get the work very well done indeed. The essential point is that we wish to get the interpretation under our control entirely. I think you cannot have too many X-ray cliniques or too many X-ray installations in connection with your special departments, but you want in this case to have an expert to help with the interpretation.

I can remember, when I was a student in Edinburgh, we had a bone room, where I spent many hours; and I am certain that if there had been radiograms of these bones I should have learned very much more, as well as something about radiology. The future teaching of radiography in the anatomical schools will consist of something in that direction—radiograms placed stereoscopically where a student can carefully study the structure of the bone and joints, and so on. I should like to see all the anatomical demonstration rooms thoroughly well fitted up with even a cinematograph arrangement; but I should not recommend anybody to do too much of it unless the protection was very thorough. With a properly taken film one could demonstrate movements quite easily.

If you consider it necessary to teach the student physics, the teaching in that subject should be on lines which would carry him on to his later work in radiology. Physics in the future will play a great part in the treatment of many medical conditions which at present we really do not know what to think of. Mr. Struthers has opened up rather a debatable point. I agree that it is possible to get all your radiograph work done by trained assistants, but I do think it takes a very long time to learn how to interpret the results. I have seen some very woeful exhibitions on the part of surgeons and physicians who ventured to demonstrate X-ray negatives to a class of students when they did not know the elements of the thing. If surgeons are going to do their own interpretation, they will have to study radiology very thoroughly, which is a strong argument for teaching the post-graduate. Does Mr. Struthers, for instance, do all his blood counts and all his bacteriological examinations? I would like to rank the radiologist on the level of the bacteriologist at least. I purposely did not go into the lines on which the student should be taught radiology. If he understands something about physics to begin with, he will in a very short time learn sufficient radiology for his needs, unless he intends to take it up seriously later. The aim of the radiologist in charge should be to see that the student understands the elements of interpretation thoroughly before he leaves the class: that is quite sufficient for the practitioner in later life. The post-graduate teaching is quite another matter. I am certain that after the war we are going to have crowds of men—Americans, Colonials, Canadians—clamouring for such instruction. Any school that will prepare for the termination of the war, and get a good post-graduate school going, will receive these men in hundreds. The men who used to go to Germany will come here if you have the post-graduate teaching in full swing.

Combine and go in for organised teaching, and you break the back of the thing at once. I would specially like to see co-operation between the surgeon and the radiologist.

LXIX.—THE TEACHING OF DERMATOLOGY.

By NORMAN WALKER.

I TAKE it we should keep in mind, first, that the aim of our discussion is practical politics and not ideals; and second, that we are dealing principally with the Edinburgh Medical School. At our last meeting, in the paper by Mr. Treacher Collins, there was a sentence to the effect that students should be shown rare cases, so that they might recognise them in future. Among the many discussions which have taken place in my time on medical education I remember one about thirty years ago in which this point was taken up by the late Sir William Gairdner. He emphasised the importance of thorough grounding in principles on a few diseases as against a superficial acquaintance with many, and Osler followed this excellent plan in Johns Hopkins.

The question I am to try to answer is, What ought a teacher of dermatology in Edinburgh to teach his students? I am sure we ought to recognise two types of students, viz. one who is going to be the successor of the old apothecary, the other the successor of the old physician. This distinction does not follow the class of practice; there are lots of successors of the old physicians on the panel engaged in very busy industrial practices, and not a few successors of the old apothecaries in very fashionable ones.

In our ordinary classes they are grouped together, and as one is under obligation to see that all one's students learn enough not to discredit their school when they go out into practice, one has to keep the inferior type constantly in mind.

It is quite impossible, even if it were wise, to cover the whole subject of dermatology in any ordinary course, and I think one ought to devote oneself mainly to general principles and to the common diseases.

The apothecary type of student ought to be able to recognise all these, and *especially the more serious ones* (lupus, syphilis, rodent) among them, and with these we ought to try to make him so familiar that he will at least recognise that a rare case is not one of the common diseases. It is no disgrace to a practitioner not to recognise pityriasis rubra pilaris, but he should recognise that he does not recognise it.

Then we ought, I think all will agree, to make provision for the man who is going to be of the physician type. I do not use this word in the restricted sense. As he is a very old friend I make free to use his name, and I will say that what I mean is the practitioner of the type of Dr. Crerar, who addressed us recently.

Before the war I tried to make such provision. For many years I conducted a senior class. It met once a week, and was limited in its membership to twelve, all of whom must have been members of my ordinary class.

I have not the affection which was proclaimed last week for the "quiz" class, and I made it more of the nature of a conference. Often the students questioned me. Sometimes one of the members read a paper; sometimes two of them collaborated to prepare one. On other occasions I asked the class to decide at the end of one meeting what subject they would like to discuss the following week, and each of them read it up. I regret that the war has put an end to this class. Not that I could not have found the time—I should have managed it somehow—but the students could not.

It was a very pleasant class to teach, and I remember with some satisfaction that nearly every Ettles man was a member of it.

Just one practical point in connection with it. I began it as a "gratis" class, but I found the attendance was not so regular as it required to be for such a class, and so I imposed a fee of half a guinea, which was handed over to Sister Watt for the provision of flowers, etc., for the ward. Student nature is very human, and the attendance was much more regular thereafter. I am still hoping that the war will end before my period of office, so that I may have one or two more of such classes. They bring one into very intimate acquaintance with the students, and I have many friends among their members.

There has been a good deal of criticism during this discussion of existing things. Some of it is, I think, misplaced, but on the whole it is healthy; indeed, I think one of the healthiest features of this discussion has been the evidence of conviction of something amiss—the first step to repentance and reform.

I do not think that the present system of educating students in "skins" is satisfactory—the time spent on the subject is too short. The official class consists of twenty meetings spread over ten weeks. Along with most other lecturers on special subjects, I interpret the twenty liberally, and each member is expected to attend on thirty occasions. But the mistake is that it is all pressed into ten weeks. We shall never get the best out of our material until this is altered. It was not so formerly.

I began my hospital work in my first winter as a dresser with Joe Bell, and during my four years of medical study a very large part of my time was spent in hospital. I agree with many previous speakers as to the great value of those evenings spent in the wards and side-rooms, educating each other by discussion—a feature not prominent enough in our school. All through my four years I saw something of skins. They came to Bell's "out-patients"; they turned up in the medical waiting-room; and the probable reason I am speaking on this subject to-night is that my chief (Dr. Claud Muirhead) was himself interested in skins, and owned a considerable collection of Baretta's casts, which he brought from Paris, and which must have cost him at least £100. Teachers should never be afraid to spend money.

I did not actually begin my teaching of dermatology to women students, but very early in my career I was appointed lecturer to one of the then two women's schools, and I gave a course the lines of which I think might well be imitated now. During the summer session I lectured four days a week at 8 A.M. in Minto House, and during a whole year I had the ladies for an hour's clinic once a week. The opportunity for this last I owed to the continual kindness and wisdom of my predecessor, who had no notion of curbing the zeal of his assistant. I will undertake to say that—with the exception of one or two men who have taken a special interest in dermatology and have attended my special classes for three or four terms—not a very uncommon thing—no graduates have left this school better equipped in dermatology than the seven generations of women I taught in Minto House.

What I think might be done to imitate this—in my judgment the best practicable system—is that arrangements should be made for systematic lectures—and I am one of those who think there ought to be lectures—to be given once a year to all students. I am entirely with those who maintain the necessity of small cliniques—and I have long enforced a limit; but in lectures it does not really matter how many listeners one has—indeed, the more the better, and I should be spared the necessity of going over three times every year the elementary principles of the subject. This would leave six days a week for clinical teaching, and it should be possible to arrange that every student during his fourth or fifth year attended once a week.

Now I know that there are difficulties about this, but I am convinced that these difficulties largely depend upon our obstinate adherence to two things, viz. the 2 o'clock consulting hour and the limitation of hospital work to the hours of 11 A.M. to 1.30 P.M. The first, I am glad to say, I had the courage to abandon some years ago when I adopted the plan of making appointments with all my patients, and I for one am perfectly ready, for the general convenience, to lecture at 2 o'clock.

With reference to the limitation of hours, I see no serious reason against some change. I know there would be a little difficulty at first—some nurses' dinner hours might require to be changed—but if it helped the school to turn out better qualified doctors, it would be worth while spreading the hospital hours over 10 o'clock to 3 or even

4 o'clock. In Glasgow the hospital cliniques are at 9 o'clock, and I have sat with my friend, the late Dr. Colcott Fox, in Westminster Hospital up to 7 o'clock seeing patients, so that changes are not impossible.

In many ways the student of to-day has advantages which were not present in my time, but in others I am sure he is not so well off. We are discussing how his condition can be improved. There is only one thing I want from the Managers, and that is room for my museum. I am the fortunate possessor of a collection of casts which, as only one of them is my own handiwork, I can say is unsurpassed out of Paris and Breslau; but for want of room they are not available to the student as they might be. If I had a proper room for the display of these, in which the student could spend an occasional hour with a descriptive catalogue, I will undertake to say that the students of this school would know a lot more of the subject when they graduate.

With reference to the discussion last week on the certificate which we lecturers on special subjects are expected to give our students, I may say that I lay far more stress on regular attendance than on written answers to questions. If the plan I have suggested were adopted, I should ascertain attendance by making the students present sign their names at each clinique, and if each student had attended over a period of one year (say sixteen cliniques) I should assume that he had absorbed enough to practise on. I think if I did not feel able to assume that, it would be time for me to consider the termination of my career as a teacher.

One more suggestion and I am done. Both students and teachers in Edinburgh require more supervision. The Dean does his best, and far more than any Dean in my memory. And he does not always get thanks. My third and youngest son has just completed his first term at Balliol. To a parent the knowledge that his boy is helped and guided in his work by a tutor to whom he has regular and easy access is a great satisfaction, and I should like very much to see a modified tutorial system in our university.

And we teachers require supervision too. There is nothing to prevent me limiting my class to twenty lectures and making these lectures mere dictation lessons. A tactful visitor might be a useful addition to the university staff. The good teachers would welcome the visits, and the others need them.

LXX.—THE TEACHING OF DERMATOLOGY TO UNDERGRADUATES.

By F. GARDINER, M.D., F.R.C.P.

In the consideration of the teaching of skin diseases as part of the medical curriculum there are four problems which emerge, and these are of necessity closely interwoven: (1) the position of the curriculum as regards time; (2) the standard of knowledge to be attained; (3) the hours available; (4) the methods of teaching.

In discussing these points I shall endeavour to be practical and not to be a visionary with a selfish point of view.

1. Placed at present in the fourth year, dermatology has to yield a place in the fifth year to eye diseases, which, in my opinion, is not correct, although it must yield to the claims of diseases of children.

At present students come to the lecturer with some knowledge of medicine and surgery at least, and this is essential for a proper comprehension of diseases of the skin. Having said this I am satisfied that this matter has been well considered in the past.

2. The standard of knowledge to be attained should be that for the general practitioner, dealing therefore only with the commoner skin diseases. A thorough instruction in these few diseases is much to be preferred to a skimming over a large list imperfectly. After all, with these few diseases perfectly grasped, the student, when he subsequently commences practice, can, with the aid of books and the first-class atlases now available, acquire knowledge of the rarer types. Among post-graduates I find that the desire, even with them, is to see the common conditions.

It is to be understood that the school medical officer and the tuberculosis medical officer will both require post-graduate courses.

3 and 4. The hours available and the methods of teaching are best considered together. Twenty hours is not enough for the ordinary student, but his hours are already overburdened and I fear to ask for extension. Some years ago I got excellent results with the women students by giving twenty-five to thirty consecutive lectures every morning at 8 A.M., while during these and the remaining weeks of the session they had also one weekly clinical meeting at 11 A.M. It is generally accepted nowadays that the demonstration of actual cases is of paramount importance and that lectures should be subsidiary.

The problem, then, is how to make the best use of the material available. The out-patient department is crowded and there are, of course, many cases not suitable for demonstration. The crux of the matter is the sifting out and assorting of this material to enable it to be of the greatest use to the student. Examining patients from 11 A.M. to 12 noon and lecturing from 12 noon to 1 P.M. on selected cases would suit admirably, but it sounds like a revolution to disturb clinical medicine.

The only other solution is to have more assistants to attend to the more chronic cases and pick out suitable material for demonstration. The varieties of the commoner diseases can be thus readily shown and this amplified by exhibition of casts, plates, and photographs.

There are six waiting days now available, and these should be used to the full by both lecturers with mutual co-operation for the good of the students.

Provision has to be made for individual instruction in microscopic work, chiefly with reference to ringworm, favus, scabies, pediculosis, and molluscum contagiosum. This should be given in the form of a tutorial demonstration and amplified at cliniques. Hours have also to be given to the commoner applications for skin treatment of lotions, pastes, and ointments, and the rationale of their use. It is advisable also to give at least two ward demonstrations on the treatment of cases in bed.

With a class of about forty divided into three sections each will have at least one clinique a week, and, if possible, more, and with, say, four to six hours spent on the above demonstrations there is left only time for about a dozen regular lectures, a few introductory lectures, then the demonstrations, and lastly the lectures on diseases not discussed in the cliniques. It is my firm conviction that some serial lectures are necessary to enable the student to grasp the subject of dermatology as a whole, and I think the above is a fair division of the time available. In conclusion, I am sure I voice a general thought when I say that the extension of the curriculum and the advances in treatment are hastening the time when post-graduate classes will become, if not compulsory like continuation classes, at least a necessity for a graduate who wants to attain a high standard in his profession.

LXXI.—THE TEACHING OF DERMATOLOGY TO UNDERGRADUATES.

By R. CRANSTON LOW, F.R.C.P.

If it were possible for every student after graduation to have a year or more hospital work before starting practice I think it would be better to leave the teaching of dermatology over till after graduation and include it as part of the clinical examination for the M.D. The same result could also be obtained by increasing the curriculum by another year to be devoted entirely to the special subjects, such as skin diseases, eye diseases, ear, nose and throat diseases, mental diseases, and gynecology. But as things are at present a student should have at least an elementary knowledge of dermatology before going out to practise. Everyone will agree that dermatology should come as late as possible in the curriculum after the student has studied pathology, medicine, and surgery. The present arrangement, where a student takes dermatology in his final year, seems to be the best possible, but it has the disadvantage that he begins the study of a new subject whilst he is in the midst of working at his other larger final-year subjects. The result is, that as skin diseases do not bulk largely in the Final Examination the student is apt to devote just as little time and energy to them as will satisfy the Regulations.

Taking into consideration the importance of other subjects I do not see that any longer time than three months could be devoted to dermatology. In such a three-months' course naturally only the common diseases can be taught. The common complaints, such as scabies, ringworm of the scalp, impetigo, psoriasis, etc., should be thoroughly taught and the rarer diseases left out entirely. In order to teach the general principles of diagnosis and treatment a certain number of systematic lectures are necessary. These could be given to all the students once a year and the clinical teaching be spread out over the three terms of the session. In this way a great deal of repetition of lectures could be avoided. On the other hand, for the clinical teaching the class must be divided into small cliniques of not more than ten students in each. In this way the student can be sufficiently near the patient to see all the details of the eruption when they are pointed out.

At present dermatology is taught from 11 till 12 o'clock. As the teaching at cliniques has to be done almost entirely from untreated out-patients it is often difficult to get material at 11 o'clock and frequently the best teaching cases only arrive after 12 o'clock. It would be an advantage if dermatology could be taught from 12 to 1 o'clock and clinical medicine, which is almost entirely taught in the wards from in-patients, could be taught from 11 to 12 o clock.

In teaching skin diseases the dermatologist should have access to cases of syphilis. The student can never learn syphilis without being able to compare the rashes with those of non-venereal conditions, and *vice versâ*.

One of the chief difficulties in skin diseases is that, as the diagnosis is almost entirely a visual one, the impression is not easily retained for any length of time. Even although a student may be able to recognise a given skin disease with fair accuracy when he has finished his three-months' class, six months or so later, if he has seen no cases in the interval, he has forgotten the appearances of the disease. Therefore after he has had the class, the student must have an opportunity of keeping in touch with skin cases. This he did formerly at the Wednesday and Saturday forenoon cliniques, which were open to all students with hospital tickets. This difficulty could be overcome to a great extent if there were a museum of casts of the common skin diseases, where the student could go at any time and read up from the notes of his lectures or a text-book with the models before him. A cast of a skin eruption also has the advantage over the actual patient in that, if the student repeatedly sees the same cast, he gets a more or less permanent visual impression of that eruption.

The present method of examining students in skin diseases is unsatisfactory and would be better omitted altogether. The lecturers on dermatology should be examiners in the Final.

By arrangement with other lecturers some overlapping might be avoided. Diseases such as chronic leg ulcer, rodent ulcer, etc., should be left to the dermatologist and not taught by the surgeon as at present.

DISCUSSION.

Dr. Traquair.—As far as undergraduate education is concerned, the special subjects should not be taught as such, but as part of general surgery and medicine. Special teaching is rather for post-graduates. It is not rare cases that should be shown to students, but common ones. An obscure case is much more likely to be an atypical appearance of a common disease than it is to be a rare disease. I sympathise with what Dr. Walker says about a museum.

Mr. Miles.—Dr. Walker has raised again the question of spreading out the special courses over a longer period. Our difficulty arises from the fact that some of our courses—the course of clinical medicine, say—last only for nine months. Why should the student not attend for three years? If we had a scheme by which he began clinical medicine in the summer following the second winter, his clinical medicine and clinical surgery might extend from this time on to the end of his course. Dr. Walker's part would then be to come into that clinical medicine course at some period found suitable, and continue his teaching throughout that course. In clinical surgery we would have a three-years' course, and into that course the eye, ear, nose, and throat specialists would come. Dr. Knox's subject would be worked in in the same way. Radiology, as applied to surgery, would be spread over the whole course, with such didactic teaching as might be necessary to give the student an understanding of the subject at the beginning. That involves the arrangement of a syllabus in co-ordination between the teachers of the different subjects.

Dr. Norman Walker said in reply.—In the Edinburgh school there always has been, and certainly is now, ample opportunity for the keen student. He will get his work always, just as with the more limited opportunities we had years ago he was able to get it. I am not quite sure that the student is altogether to blame. We have got into a more concentrated form of teaching, and these specialties have perhaps encouraged it. My experience is that when students get opportunities and are encouraged to make use of them they do so.

I would be very willing to fall in with the course of clinical medicine, but I should also require to fall in with the course of systematic medicine to teach something of the general principles to the students. I would not be satisfied merely with a course of demonstrations.

I do not agree about confining our teaching to the idea of the general practitioner—the apothecary type. We expect to teach a large proportion of the better-class practitioner—the man who is really an interested and enthusiastic physician.

If we had an extension of the hospital hours we would solve a great many of our difficulties, and it would help if we had some of the out-patient departments in the afternoon.

With regard to the question of the vacation, it is surely strange that in the fourth and fifth years of his apprenticeship to one of the most important professions a student should be allowed to idle for three and a half months. No other profession would allow it.

LXXII.—SUGGESTIONS FOR THE UTILISATION OF THE POOR LAW HOSPITAL FOR TEACHING MEDICAL STUDENTS.

By T. Y. FINLAY, M.D., Medical Superintendent, Edinburgh Poor Law Hospital.

In some of the earlier papers read before this Club—and I refer especially to those of Sir James Mackenzie and Dr. Robertson—great stress was laid upon the study of disease from the preventive point of view. Sir James Mackenzie drew attention to the out-patient department of the Infirmary as a centre for the study of the early stages of disease, whilst Dr. Robertson advised the teaching of medicine not only as a curative but also as a preventive science and art, its preventive application to individuals and to all diseases—in other words, a clinical form of preventive medicine. An adequate study of disease in its development is what is required in clinical teaching, for it is important to the patient that the first beginnings of disease should be detected and its subsequent development arrested if possible. This is the knowledge which is most required in general practice from the very first.

Up to the present, medicine has been taught mainly from the standpoint of curative measures, and the student's attention has been directed to the study of the signs, symptoms, and treatment of disease in its fully developed form. The reason for this is obvious—the student has to rely chiefly on the Infirmary for his clinical teaching, and before the patient finds his way to the Infirmary wards his disease is more or less serious; hence it is that the pronounced, fully developed type is presented to the student, and his interest is apt to be concentrated on this to the neglect of the less serious and less developed stages of the disease, though these are equally if not more important from every point of view. Again, the Infirmary patients do not stay and only very seldom do they return, therefore the opportunities of following the development of disease are correspondingly very limited. Sir James Mackenzie points out the knowledge which comes to the men in general practice who can follow the health history of their patients from year to year, and he advocates the appointment to a chair in clinical medicine of a general practitioner who could give the students the results of his continuous observation of cases.

With the view of suggesting another method of solving this question, I have thought it might be useful to consider the facilities for clinical study and teaching which are offered by the poor law hospital. The poor law hospital receives patients who, when they are ill, have no other resource than that of coming to the hospital. There are two types of these patients—first, the chronic invalid, and second, the person suffering, for example, from some painful symptom, not severe, but which is sufficiently bad to prevent him doing his work and earning his living for the time being. Both these types of cases are excluded from the Infirmary wards—the first because the accommodation is not sufficient to retain them for prolonged periods to the exclusion of acute cases; and the second is the type which presents itself at the out-patient department and, not being considered sufficiently ill to warrant indoor treatment, consequently next seeks admission to the poor law hospital. Now, these two types bulk largely in the clientele of the general practitioner, who has little opportunity of studying them in his student days. The chronic cases remain in the poor law hospital for a prolonged period, if not permanently, whilst the second class of case comes back repeatedly, and gradually there are accumulated observations on the development of their illnesses which are invaluable for the study of disease. It is in the number of such cases (on an average 1000 a year excluding re-admissions) that the poor law hospital can offer the opportunity which is not sufficiently provided in the Infirmary. The essential feature of the poor law hospital is that within its wards are to be seen cases of almost every description from infancy to old age. It may, therefore, be likened to a general practice with this advantage, that all the patients are collected together under one roof and under the close observation of trained nurses.

The only poor law hospital of which I have any experience is that of Craiglockhart under the Edinburgh Parish Council, so that the following remarks are based entirely upon my experience there.

Let me first give you a brief description of the hospital to show that it is run along modern lines, and is up to date in hospital equipment, thus offering facilities for teaching purposes.

The hospital itself is built mainly on the pavilion system. There are about eighteen wards, with, in addition, a maternity department and side-rooms for the isolation and treatment of special cases, two open-air sheds, a modern and fully equipped operating theatre and sterilising room, a dispensary for drugs, a clinical laboratory for side-room work, an out-patient department in connection with the poorhouse proper, a suitable post-mortem room, and the usual administrative offices. At the present time, as a war emergency, several more wards in the adjoining poorhouse have had to be devoted to hospital cases. This has been rendered necessary for the accommodation of the sick poor from Craigleith and Seafield, both of which buildings are at present otherwise utilised. In all there are about 500 beds available for patients at the present time.

In normal times the staff consists of a principal medical officer, a consulting surgeon—Mr. Beesly; a consulting eye specialist—Dr. Traquair; two assistant medical officers and two unqualified clinical assistants—though during the war even this small staff has had to be reduced—a matron, assistant matron, night superintendent, charge nurses, and probationer nurses.

The name of every patient on admission is noted on a card index and a number given to each, which is also noted on the medical history sheet. Each time the patient returns he retains the same number, so that the medical history sheet bears not only a record of the condition at one admission, but forms a complete account of the whole of the patient's medical history, no matter how long or how often he has been in hospital. Thus is constructed a valuable record of disease over many years, and in many cases up till the time of death, with, in addition, the post-mortem findings at least in the case of nearly all but unclaimed bodies. It is a well-recognised fact that in general practice the treatment of many cases resolves itself into the treatment of symptoms, for a large majority of them do not conform to text-book descriptions; so also at Craiglockhart a large number of such cases present themselves—they come not once or twice but many times, and each time records are kept, so that in many cases, when each of these records is read as a whole, the various stages of disease can be followed out and studied until the fully developed disease, as seen in the Infirmary, shows itself. Further, I can foresee much useful information being collected from these records for the preventive treatment of disease, which to be complete should not only include a description of the symptoms, but also any facts—and I speak of facts in the broadest sense—which may in any way be connected with the onset of the symptoms—weather conditions, diet, exposure, mode of living, over-exertion—in short, any condition, moral or physical, leading up to each of these stages of disease.

It may be of interest to briefly describe the general type of cases dealt with at Craiglockhart Hospital. In the children's ward there are about 500 admissions in the year. Some of these children are admitted suffering from skin diseases such as scabies, impetigo, and ringworm, whilst others are tuberculous, congenitally syphilitic, and in a large proportion infants suffering from nutritional disabilities. There are about thirty confinements in the year, and the patients are admitted in both early and late pregnancy. The births as a rule are normal, but every now and again interesting abnormal cases are dealt with. Surgical operations are performed by Mr. Beesly on one afternoon a week, and of these there are an average of 100 to 150 per annum. Most of the surgical cases are tuberculous or malignant, though many of a general character also are admitted. Dr. Traquair holds an eye clinic, when many instructive cases present themselves. Of the medical cases there are always a good number of chronic and senile heart disease, aneurysm, arteriosclerosis, chronic bronchitis and emphysema, asthma, senile pneumonias, fibroid lungs, chronic rheumatism, rheumatoid arthritis, senile chorea, cerebral hæmorrhage, locomotor ataxia, paralysis agitans, hemiplegia, cerebral softening, not to mention the normal changes resulting from old age. Other cases are those of general pediculosis, scabies, venereal disease, and leg ulcers. In this rapid sketch I have only mentioned a few of the many diseases which have to be dealt with, but sufficient, I trust, to give a general survey of the work involved in a poor law hospital.

It seems to me that there are possibilities at Craiglockhart for teaching both the junior and senior student of medicine, and I offer the following suggestions for the consideration of the Club:—

I. A junior course for the beginning of medical study. I have long thought that Craiglockhart Hospital offered excellent scope for such a course, but as I find that Dr. Fowler has already dealt with this subject in a former paper before this Club, I shall not trouble you with any details. There is ample material at Craiglockhart for teaching everything which he includes in his suggested course of clinical physiology. Take only one example from his list: Where better than in the poor law hospital could be taught the effect on the functions of the body and on symptoms generally, of exhaustion and debility, of pregnancy, the menopause, and of old age?

II. Another opportunity offers in the large number of excellent cases suitable for teaching physical signs. When I was a clinical tutor in medicine at the Infirmary the difficulty often was to get enough suitable cases to teach from. One was dependent upon the cases in the ward for the time being, and these did not always show unmistakable typical physical signs necessary for teaching the junior student. At Craiglockhart, on the other hand, there is no lack of such patients—for example, chronic heart and lung cases who are permanent inmates and therefore available at all times. After having mastered gross lesions the student is in a better position to make out and appreciate the physical signs in less advanced cases.

III. Thirdly, courses on chronic diseases and clinical preventive medicine for senior students would be valuable in preparing them for general practice. Such a course would naturally come in the final year after the student had completed his course in clinical medicine at the Infirmary. Such a course has already been arranged to begin next winter—Professor Gulland is to hold a class on Saturday forenoons in the October term—subject to the final approval of the Edinburgh Parish Council at its next meeting.

IV. Lastly, the subject of infant welfare is one which has become very important, and one with which the medical student should be made familiar. I know of no other institution in or around Edinburgh except Craiglockhart which has more unique opportunities for practical training in infant welfare. The material includes pre-maternity cases, maternity cases, nursing mothers and their infants, a nursery for healthy infants, and wards where the nutritional diseases of infancy can be studied. At present the student's experience is limited to what he learns at the Maternity Hospital and the Sick Children's Hospital. There is thus a very important gap in his training, namely, the practical study of the normal healthy baby, and the knowledge of how to prevent disease in infancy. Dr. Fowler remarks in his paper that "at present we have no material for showing the student how to manage a healthy infant from birth onwards." Now it is exactly this material that is available at Craiglockhart and which could be used for teaching purposes. From what I have said it will be evident that there is all the material at Craiglockhart for a very complete course on every aspect of infant welfare. I may say that such a course of practical training is at present being held—the Committee of the Edinburgh School of Social Study and Training having obtained permission from the Edinburgh Parish Council for the teaching of their students at Craiglockhart, and it only awaits the approval of the Parish Council to have a similar course available for the medical student.

In conclusion, I think that we are fortunate in Edinburgh in having a Parish Council which is in sympathy with the medical school and anxious to co-operate with the university in extending its teaching facilities.

Note.—At a meeting subsequent to the reading of this paper the Edinburgh Parish Council unanimously consented to clinical teaching being carried out at Craiglockhart Hospital.

DISCUSSION.

Dr. Chalmers Watson.—Twenty-five years ago I was house physician at a poor law hospital, and I formed there a first-hand impression of its extreme value as a teaching institution. It is not so much the lack of material in the Infirmary wards as some defect in our organisation which has increased the tendency of the student to do less clinical work. There is no question of the value of the material at the poorhouse and of the willingness of the Infirmary staff to take advantage of it, as they find it would be useful, provided it is not going to detract from the already extremely limited time that the students spend in the wards. Sir James Mackenzie laid stress upon the importance of watching disease in the making. We do not lay sufficient stress on the early signs of deterioration in health, a knowledge of which can be acquired by careful study of the antecedents of our cases.

There is no question with regard to the advantages of the poor law hospital in connection with child welfare, infant feeding, and the diseases of children.

Dr. Rainy.—I have on several occasions been able to borrow from the poor law hospitals quite a number of cases illustrative of a special condition for lecture purposes. They have advanced cases and types of cases that we cannot possibly get at the Infirmary. I cordially endorse the opinion that these poor law hospitals should be made much more use of than they are at present.

Professor Lorrain Smith.—I gather that Dr. Finlay contemplates the student spending half a day or a day at the poor law hospital?

Dr. Finlay.—I suggest that Saturday forenoon only should be devoted to the poor law hospital, where the student would take up more than one branch of a subject at once.

LXXIII.—REPORTS OF STUDENTS' SOCIETIES.

At the request of the Pathological Club, the Royal Medical Society took into consideration the subject of medical education from the point of view of the undergraduate.

A series of discussions were held in which, in addition to the members of the Society, other students, representative of all years, took part. A special committee of the Society subsequently drafted a report which was forwarded to the Pathological Club. The members of the Women's Medical Society, who had taken part in the Royal Medical Society's discussion, submitted a separate report.

These reports, which covered the whole of the ground, agreed in the main in their criticisms of the existing curriculum and in the suggestions made for improving it. They have proved most helpful to the Club in framing its report, in which a number of the proposals made by the undergraduates, particularly in the direction of increasing the facilities for practical work, have been incorporated.

REPORT OF THE EDINBURGH PATHOLOGICAL CLUB ON THE TRAINING OF THE STUDENT OF MEDICINE.

I.—General Considerations.

The inquiry into the medical curriculum has included within its scope all the subjects of study in the general course of medicine. The great majority of the students are preparing for general practice, and in this course they lay the foundations of their future work. Each contributor to the inquiry has dealt with his subject by showing the place which it should occupy in a complete course, and a review of the contributions brings out the fact that criticism of the present curriculum is advanced from two points of view, determined by the distinction which is drawn between curative and preventive medicine.

The Teaching of Curative Medicine.—It is agreed that the main purpose of medical teaching in general is to train the student in clinical observation, so that he may become skilled in the diagnosis and treatment of cases of illness and disease. His chief aim is to acquire knowledge of the science and art of curative medicine. The courses included in the present curriculum have been instituted with this end in view, but the inquiry has brought out abundant evidence of the necessity of reorganising the present methods of teaching. Before considering this aspect of the question in detail, it is necessary to take account of the criticism of the curriculum which has been offered from the point of view of preventive medicine.

The Teaching of Preventive Medicine.—It is pointed out by a number of contributors that the basis of the present curriculum is too narrow. A complete curriculum should include a study of the prevention of disease, but the training which is obtained at present is restricted almost entirely to curative medicine. This far-reaching criticism extends the conception of prevention to the whole field of medical teaching. In the past, preventive medicine has developed chiefly in the form of public-health measures for the protection of the community from the spread of disease. Examples are found in the regulation of general sanitary conditions and in the safeguarding of industrial workers from the harmful effects of their occupation. General measures of this type were, as a rule, simply preventive. In certain cases—as, for example, in dealing with infectious disease—the public authority made provision also for the treatment of individual patients. In recent legislation, such as that dealing with tuberculosis and venereal disease, public responsibility for the treatment of patients has been greatly extended.

The development of State medicine has produced various important changes in the medical profession. In former times the medical care of the community was left entirely to the medical profession. The members of the profession worked each in his own practice, or joined together to establish hospitals and dispensaries to bring the resources of medicine within the reach of the whole community. However ample such provision might be, it nevertheless failed when the necessity for preventive measures arose. Although these measures are the direct outcome of medical investigation of the causes of disease, the profession had neither the means nor the authority to apply them to the community. The responsibility for preventive administration must remain in the hands of the State. It is found, however, that the State, in taking up this responsibility, may profoundly modify the conditions of medical practice. The Act of Parliament which deals with a health problem includes provision of the mechanism required for the administration of the measure. In certain cases medical officers are appointed, who give their whole time to the particular branch of medical work to which the Act relates. In other cases the work is done by general practitioners. In medical practice for the State, whatever form it may take, prevention is a primary object. At the same time it must be remembered that there is no fundamental distinction between curative and preventive medicine. Medicine has always been essentially both curative and preventive, and the inseparable connection of the two types has been shown by the recent developments of State medicine. Further, the preventive measures introduced by the State do not include more than a limited part of preventive medicine. On the contrary, the field for preventive work is unrestricted, and the practitioner, in all his work as physician, surgeon, or obstetrician, finds that preventive care of his patients is becoming more and more a definite part of his responsibility.

In view of this widening of responsibility, it becomes necessary for the medical faculty to extend the training of the student, so that he may obtain the knowledge required for medical care of this type. Instruction in preventive medicine must be given to all medical students. It is altogether undesirable to separate curative and preventive medicine.

The piecemeal introduction of State measures has a tendency to create medical officials whose interest is too much limited to a defined and circumscribed field of work, and one of the unfortunate effects of setting up medical departments by the State has been to displace the general practitioner. The benefits which the community can derive from the most comprehensive efforts of a State department will be unduly limited unless the whole profession of medical practitioners become the exponents of preventive as well as of curative medicine.

To render unnecessary any separation of curative and preventive medicine, it lies with the medical schools to include in the general course the training in preventive medicine which is required.

The Arrangement of Subjects in the Curriculum.—The commencement of the study of clinical medicine at the beginning of the third year forms the most important point of division in the present medical course. The subjects of the first two years are botany, zoology, physics, chemistry, anatomy, and physiology. During these two years the student has little or no instruction in clinical work. On the other hand, during the following three years he has few opportunities of continuing the study of the earlier subjects. A reorganisation of the course is required, so that the earlier and later subjects may be brought into more vital connection with each other. Continuity of study is required to enable the student to make full use of the knowledge he gains. From lack of connection and co-ordination of the courses he often fails to grasp clearly the meaning and value of what he has been taught. His knowledge does not become a permanent possession. One example may be taken from the discussion to illustrate this criticism.

The student is, by the end of his second year, well grounded in anatomy, and passes the examination in that subject; but in his fifth year, when he is asked to apply his anatomical knowledge to the interpretation of a case of disease, he often reveals the fact that his former knowledge has melted away in the interval. The modicum of working anatomical knowledge which should have been permanently fixed in his mind is no longer his. This form of failure is found more or less in all branches of the course.

The root cause of it is that the subjects are taught without sufficient correlation with each other and with the main purpose of the course. The earlier scientific studies are not brought into sufficient connection with the later work in the hospital, and the clinical studies are not kept in continuity with the preparatory courses. The present system of periodic examinations is no remedy. Teaching and training in water-tight compartments are followed by corresponding examinations, and in some ways they tend to increase the dislocation of the course. The remedy which has been suggested by many contributors is that the student should study clinical work from the beginning to the end of the five years' curriculum, and that the study of the fundamental sciences should be brought into direct connection with the later subjects, and should not be confined to the first two years.

The course in chemistry gives an example of the co-ordination which is required. The student has chemical teaching throughout the whole curriculum, but the teaching varies from the early introduction to the science till the final stages are reached, where clinical methods are applied to the interpretation of the processes of disease. The chemical department of the medical school should be responsible for the subject in all its aspects, and supply at each stage the teaching in the form required. The complete course would become unified in the student's mind, and there would be no dislocation.

The Method of Teaching.—The general method of teaching which is now adopted is that for each subject there is a course of systematic lectures and a course of practical instruction. The courses of practical instruction have come to occupy a relatively large part of the time devoted to the subject, but reorganisation is required to bring the two methods of teaching into more direct connection with each other. The systematic lecture class is separate from the practical course, and the lectures furnish an exposition of the subject more or less resembling that of a text-book. It is generally agreed that this is an unfruitful method of giving instruction to the student. On the other hand, the facilities for practical instruction are now developed to such an extent that it becomes possible to devise courses in which the two methods of teaching are united and immediately complementary to each other. The lectures to which a student is asked to listen should be directly related to his practical work—an illustration will make the point clear. The student is expected to make himself acquainted with the commoner varieties of disease of the blood. On the present system he may receive a full exposition of this complicated subject before he has had the opportunity of estimating the hæmoglobin or observing for himself the numbers and varieties of blood corpuscles in the living subject. On the method of combined practical and theoretical teaching now proposed this would be impossible. The systematic lecture could not be given until the foundation of practical knowledge had been laid. The occasion for giving the systematic lecture would arise when the data obtained from practical observations demanded further interpretation.

To organise teaching in the form of a combined course would without doubt present much greater difficulty than the present method. On the other hand, the effects of the separation of practical and theoretical teaching are felt nowhere more than in the professional courses. Here the systematic courses are given in the University and the practical instruction in the Infirmary, and there is no direct connection between the two.

The Examinations.—Much adverse criticism has been advanced with regard to the present method of testing by examinations. It is pointed out that the examination which is separated from the teaching course is liable to become an artificial test. It encourages book knowledge and belated cramming on the part of the student. The passing of examinations tends to become the chief occupation of his mind, and he refuses to attend to those aspects of the subject which do not lend themselves to this purpose. The examinations come at intervals through the course, and for each the student makes a strenuous effort, which becomes in many ways an interruption of his course of study. Further, the examination is a great burden on the teaching staff, and consumes time and energy which, if spent on teaching, would add much to the course. The professors conduct the examinations with the co-operation of external examiners appointed by the University. In addition to this, the General Medical Council appoints inspectors whose duty it is to attend the Final Qualifying Examinations and report on their sufficiency as a test of the student's knowledge.

It is suggested that the test of the student's proficiency should apply not to what he does at an occasional examination, but to the whole of his term work. It would be the duty of each department to keep a record of the student's work which would afford clear and sufficient evidence of his success or failure in reaching the requisite standard of knowledge. This method of testing would form a powerful stimulus to the student throughout the whole course. The external examiner would co-operate as before, but in this case the whole work of the term would come within his purview.

II.—PROPOSALS.

After discussion, the Club adopted the following propositions:—

1. *Age to Commence Medical Studies.*—The Club is unanimously of opinion that students should not begin the study of medicine in the Medical School before the age of eighteen. It is further of opinion that the standard of the preliminary examination should be raised.

2. *Curriculum to Begin in Winter Session.*—To obviate the confusion which results from students beginning their studies at different periods of the year, and to facilitate the arrangement of a co-ordinated course of study, the Club considers it essential that all students should commence their studies in the Medical School in the winter session.

3. *Proposal to Lengthen Terms.*—The Club suggests that the time available for teaching throughout the year should be increased by shortening the vacation periods. It appears to the Club that this would best be effected by adding two weeks to each of the three terms.

4. *Facilities for Evening Study in Hospital.*—The Club desires to impress upon the authorities concerned the importance of providing facilities for students attending at the Infirmary wards and out-patient departments in the evening for purposes of clinical work and study—subject always to the interests and comfort of the patients being safeguarded.

5. *Facilities for Physical Culture.*—With a view to encouraging the students to engage in sports and other forms of physical culture, the Club recommends that the afternoon of each Wednesday, as well as of each Saturday, be left free of classes.

6. *Holidays in Term.*—It strongly urges that there be no other statutory academic holidays during term.

7. *Preliminary Study of Chemistry and Physics.*—The Club recommends that the subjects of *Elementary Chemistry* and *Elementary Physics* be taken either at school or as preliminary courses, and that the courses of physics and of chemistry within the curriculum be correspondingly modified. It is also suggested that the position of *Botany* in the course be reconsidered.

8. *Systematic Lectures.*—With regard to the place of systematic lectures in the curriculum, the Club is strongly of opinion that in all courses of instruction these should be closely associated with practical laboratory or clinical work, and that the *rôle* of the lectures should be to elucidate the work done in the practical and clinical classes and to correlate the subject under consideration with allied subjects. The time devoted to didactic teaching could thus be reduced, and more time made available for observational classes.

9. *Junior and Senior Courses.*—The Club recommends that, as far as is practicable, all courses of instruction should be divided into "Junior" and "Senior" courses, the junior course to be conducted as early in the curriculum as possible, and the senior course in a later year, after the student has acquired sufficient practical knowledge of the subject dealt with, *e.g.* (*a*) the junior course in medicine in the third year, just after the "physical signs course," and the senior course in the fifth year, after the student has spent several terms in clinical study; (*b*) the junior course in surgery in the third year, after the student has worked in the out-patient department during two or three terms, and the senior course in the fifth year, after he has worked in the wards for several terms; (*c*) the junior course in midwifery in the fourth year, and the senior course in the fifth year, after maternity cliniques have been attended and midwifery cases taken out.

10. *Co-ordination of Subjects.*—To cultivate in the student a scientific interest in his professional work, the Club strongly urges that the teaching of the fundamental subjects—physics, chemistry, anatomy, physiology, pathology, etc.—be closely co-ordinated with that of the clinical subjects with which they are related.

11. *Necessity for Syllabus.*—To provide for such co-ordination it would be necessary for the teachers of each associated group of subjects to draw up a syllabus defining the scope of the work to be overtaken by them, jointly and severally.

After being approved by the Faculty of Medicine, this syllabus should be made available to the student as a guide to him in conducting his studies. The syllabus should be subject to revision annually.

On such a plan, co-ordination of teaching could be effected between the subjects included in the curriculum in such a way as to impress upon the student their bearing upon one another, and to maintain continuity of study of associated subjects throughout the curriculum.

12. *Attendance at Hospital Recommended during Whole Curriculum.*—Still further to ensure that the student shall acquire and maintain a scientific attitude of mind towards the purely professional aspects of his studies, the Club is of opinion that he should be brought into direct contact with the work of the hospitals throughout the whole of his curriculum. It is felt that an early introduction to the clinical features of elementary surgery and medicine would add interest and give point to his studies of the biological and physical sciences, and still more to such subjects as anatomy and physiology. It would also be an advantage if anatomical and physiological demonstrations were illustrated as far as possible from living human subjects.

The draft curriculum which has been drawn up provides for the student attending the hospital during every term of the course.

13. *Co-operation with Dispensaries, etc.*—To widen the scope of clinical teaching, and to give the student a broader outlook on problems of health in relation to the State as well as to the individual, the Club strongly urges that close co-operation be established between the Medical School and the dispensaries, poor law hospitals, child-welfare organisations, and other medical and social institutions throughout the city and district.

In any new arrangements that may be made under the proposed Ministry of Health, the educational importance of public hospitals and other institutions must be borne in mind and provision made for teaching being carried on therein.

14. *Instruction re Practice under National Insurance Act.*—In the interests of the large section of the community who obtain medical care under the provisions of the National Insurance Act, the Club recommends that some arrangement be made by which senior students may receive instruction in the practical working of the Act, with special reference to the management of illness in small houses and with limited resources.

15. *Examinations.*—Lastly, the Club is unanimously of opinion that the existing method of testing the student's knowledge by periodic "Professional Examinations" is not satisfactory. It recommends that it be made part of the duty of every teacher, in co-operation with extra examiners, to test and record each student's progress throughout the course, as part of the class work, and that such records be the main criterion of the student's fitness to proceed further with his studies. Such a plan does not preclude the holding of examinations apart from the class work, either to test doubtful students or to award "distinction" to the most proficient.

III.—OUTLINE OF PROPOSED CURRICULUM.

Guided by the general considerations above set forth, and assuming the acceptance of the foregoing proposals, a provisional curriculum has been drafted, in which the suggestions that seemed to find most favour in the inquiry have been incorporated.

The accompanying tables show how the suggestions can be embodied in a complete curriculum.

In the draft curriculum prepared by the Club, each subject or section of a subject is allocated to its appropriate *term* in each year, but to avoid confusing detail the tables here given merely indicate the *year* in which a particular subject is studied.

COURSE OF INSTRUCTION IN CHEMISTRY.

Year.
SCHOOL. Elementary Chemistry.
I. Introductory Course—Lectures and Practical Class.
II. Physiological Chemistry, with Physiology.
III. Pathological Chemistry, with Pathology.
II.-III. Chemistry in relation to Clinical Medicine, with Clinical Medicine.
V. Chemistry in relation to Public Health, with Public Health.

COURSE OF INSTRUCTION IN PHYSICS.

SCHOOL. Elementary Physics.
I. Introductory Course—Lectures and Practical Class.
II. Electricity and X-rays, with Physiology and Hospital Work.
III. Sound and Acoustics, with Aural and Laryngeal Surgery.
IV. Light and Optics, with Ophthalmology.

COURSE OF INSTRUCTION IN ZOOLOGY.

I. General Course—Lectures and Practical Class.
III. { General Biological Problems relating to Pathology.
Parasitology, with Pathology

COURSE OF INSTRUCTION IN BOTANY.

I. General Course—Lectures.
„ Practical Class.
„ Field Botany.

COURSE OF INSTRUCTION IN ANATOMY.

Year.

I.-II. { Introductory Course.
Histology Course.
Practical Course—Dissecting (5 terms).
Medical Anatomy, with Physical Signs Course in Clinical Medicine.

III. Regional Surgical Anatomy, with Clinical Surgery.
Anatomy in relation to Aural, Nasal, and Laryngeal Surgery, with Aural, etc., Surgery.

IV. Obstetric Anatomy, with Midwifery and Gynecology.
Anatomy in relation to Ophthalmology, with Ophthalmology.

V. Anatomy of Central Nervous System, with Neurology.

COURSE OF INSTRUCTION ON PHYSIOLOGY.

I. General Course—Junior.
Practical Class.

II. General Course—Senior.
Experimental Physiology, with Physical Signs Course in Clinical Medicine.
Physiological Chemistry, with Physical Signs Course in Clinical Medicine.

III. Physiology of Digestion, Excretion, etc., with Medicine.
,, in relation to Aural, Nasal, and Laryngeal Surgery, with Aural, etc., Surgery.

IV. ,, in relation to Obstetrics, with Obstetrics.
,, in relation to Ophthalmology, with Ophthalmology.

V. ,, of Central Nervous System, with Neurology.

COURSE OF INSTRUCTION IN MATERIA MEDICA.

Year.
III. General Course—Materia Medica.
" " Pharmacology.
Prescription Writing, with Medicine.
Practical Class.
IV.-V. Therapeutics, with Clinical Medicine.

COURSE OF INSTRUCTION IN PATHOLOGY.

II. Morbid Anatomy in relation to Physical Signs, with Clinical Medicine.
Bacteriology in relation to Venereal Diseases, with Venereal Diseases.
III. General Course—Lectures.
" " Practical Class.
" " Class of Morbid Anatomy.
Bacteriology—General Course—Lectures.
" " " Practical Class.
Parasitology (Zoologist).
Surgical Pathology and Morbid Anatomy, with Surgery.
IV. Pathology in relation to Obstetrics and Gynecology, with Midwifery and Gynecology.
V. Pathology of Central Nervous System, with Neurology.
Pathology of Tuberculosis, with Tuberculosis.
II.-V. Post-mortem Examinations—Medical.
" " Surgical, etc.

COURSE OF INSTRUCTION IN CLINICAL MEDICINE.

Year.
II. Physical Signs Course—Clinical Demonstrations.
,, ,, ,, Regional Anatomy of Chest, etc.
,, ,, ,, Experimental (Clinical) Physiology.
,, ,, ,, Medical (Side-room) Chemistry.
,, ,, ,, Use of Ophthalmoscope.
,, ,, ,, Use of Laryngoscope.
,, ,, ,, Use of X-Rays Clinically.
,, ,, ,, Morbid Anatomy bearing on Physical Signs.
III. General Medicine Course—Junior—Lectures.
,, ,, ,, ,, Tutorial Classes.
,, ,, ,, Prescription Writing, with Materia Medica.
,, ,, ,, Elementary Psychology.
Clinical Medicine—Lectures.
,, ,, Cliniques.
,, ,, Out-patients.
IV. Medical Diseases of Children—Lectures.
,, ,, ,, Clinical.
,, ,, ,, Tutorial.
,, ,, ,, Baby Clinics.
,, ,, ,, Child-Welfare Work.
Clinical Medicine—Lectures.
,, ,, Cliniques.
,, ,, Out-patients.
Ophthalmology.
Dermatology in Association with Venereal Diseases.
Mental Diseases—Asylums.
,, ,, Cliniques in Royal Infirmary.
,, ,, Incipient Mental Diseases.
Dispensary.
V. General Medicine Course—Senior.
Clinical Medicine—Lectures.
,, ,, Cliniques.
,, ,, Out-patients.
Infectious Diseases at Fever Hospital.
Tropical Diseases.
Tuberculosis.
Neurology.
Therapeutics—Physical Methods of Treatment.
,, Practical Nursing.
Dispensary.
Poor Law Hospitals.
Incurable Hospitals, etc.

COURSE OF INSTRUCTION IN CLINICAL SURGERY.

Year.
I. Surgical Out-patient Department—Elementary Demonstrations (two hours weekly).
II. Surgical Out-patient Department—Dressing.
Venereal Diseases.
III. General Surgery Course—Junior—Lectures.
" " " " Demonstrations.
" " " " Tutorials.
Surgical Pathology and Morbid Anatomy, with Pathology.
Clinical Surgery—Cliniques.
" " Operations.
" " Tutorials.
Anæsthetics.
Regional Surgical Anatomy, with Anatomy.
Aural, Nasal, and Laryngeal Surgery.
Sound and Acoustics, with Physics.
Anatomy of Ear, Nose, and Larynx, with Anatomy.
Physiology of Ear, Nose, and Larynx, with Physiology.
V. General Surgery Course—Senior—Lectures.
" " " " Tutorials.
" " " " Demonstrations.
Surgery of Children—Lectures.
" " Cliniques in Wards and Out-patient Departments.
" " Operations.
Clinical Surgery—Cliniques.
" " Operations.
" " Tutorials.
" " Practical Nursing.
Practical (Operative) Surgery.
Surgical Dispensaries—Minor Operations.

COURSE OF INSTRUCTION IN OBSTETRICS AND GYNECOLOGY.

Year.
IV. General Midwifery Course—Junior.
„ „ „ Lectures.
„ „ „ Tutorials.
Maternity Cliniques.
Maternity Cases.
Ante-natal Cliniques.
Anatomy in relation to Obstetrics and Gynecology, with Anatomy.
Physiology in relation to Obstetrics, with Physiology.
Operative Midwifery.
Clinical Gynecology—Cliniques.
„ „ Tutorials.
Pathology and Morbid Anatomy in relation to Gynecology, with Pathology.
V. General Midwifery Course—Senior.
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